The Electrical Industry's Weekly Magazine

June 3, 1957

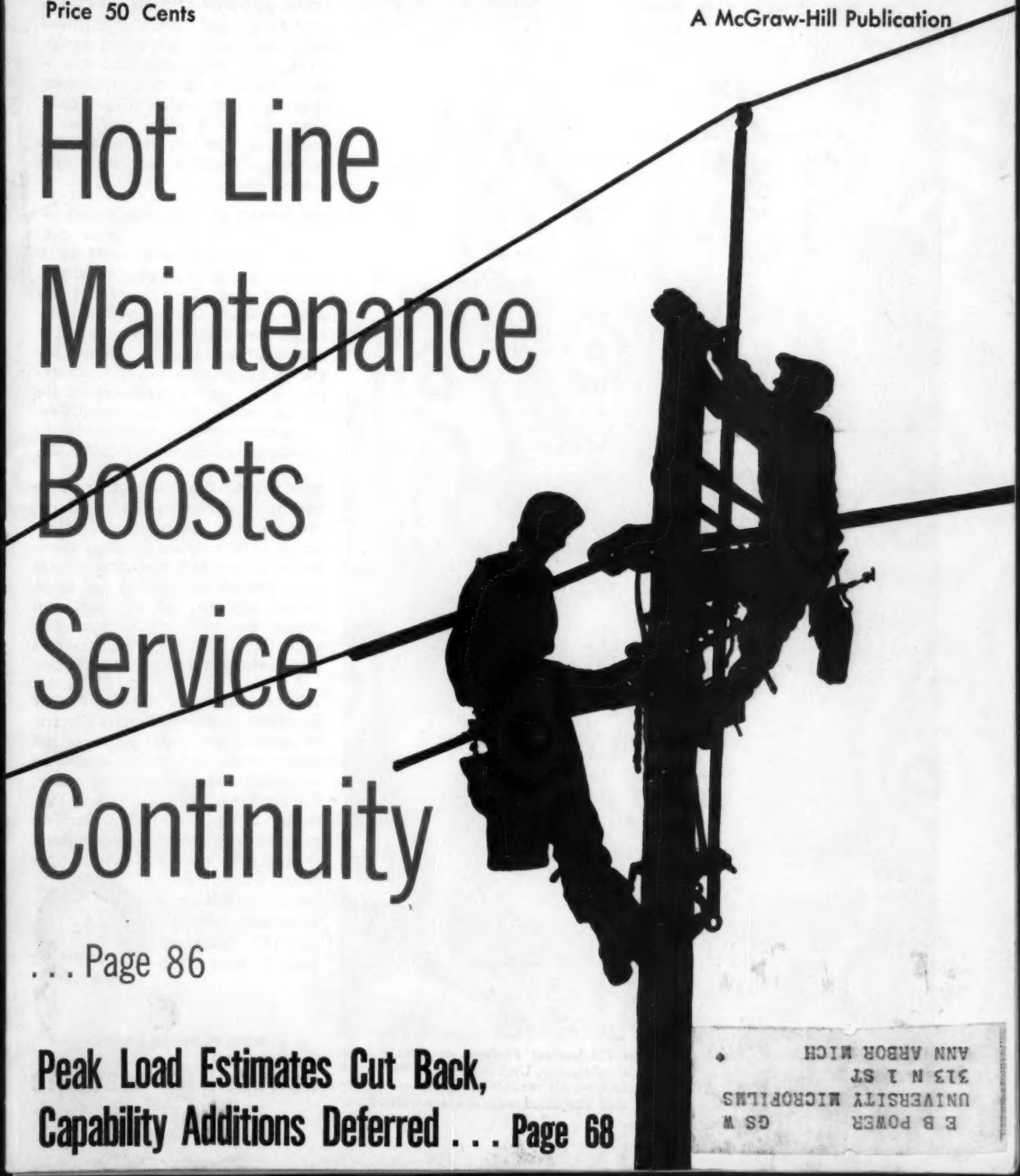
Electrical World

Price 50 Cents

A McGraw-Hill Publication

Hot Line Maintenance Boosts Service Continuity

. . . Page 86



Peak Load Estimates Cut Back, Capability Additions Deferred . . . Page 68

E B POWER GS W
UNIVERSITY MICROFILMS
313 N 1 ST
ANN ARBOR MICH

New Preferred Design transformers will hasten economies through simplified system planning

First Power Transformer with Uniform Mechanical Features is installed by Missouri Public Service Co. at Grandview substation. Unit is rated 20,000/26,667 /33,333 kva. Preferred Design transformers—with mechanical parts of similar shape and arrangement—allow earlier and simplified substation construction.

LOAD GROWTH AND RISING COSTS of the magnitude being experienced today necessitate improved equipment, new techniques and economies. General Electric engineers, aided by a preference survey of utilities, have evolved a new power transformer line that promises added economies through simplified substation and system planning.

PREFERRED DESIGN transformers incorporate customer-preferred mechanical features determined by a series of comprehensive studies. The effect is that PD transformers use components of similar shape and arrangement. This means construction of substation superstructure can begin almost immediately, since drawings approved for construction are enclosed with each PD proposal. Preferred Design transformers are available in ratings of 5,000 to 50,000 KVA.

QUICKER DELIVERY is another major benefit of Preferred Design transformers. A giant computer, calculating at speeds up to 3800 times faster than hand methods, makes more precise calculations and helps assure selection of the optimum design for each application. The result . . . improved transformers can be shipped 6 to 12 weeks faster.

THIS SIGNIFICANT DEVELOPMENT is another move by General Electric to simplify and speed planning and construction, and reduce operating costs for the electric utility industry. For further information on how Preferred Design power transformers can effect economies on your system, contact your General Electric Apparatus Sales Office. General Electric Company, Section 301-357, Schenectady 5, New York.

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MORE POWER TO AMERICA

GENERAL ELECTRIC

Electrical World

Vol. 147, No. 22 June 3, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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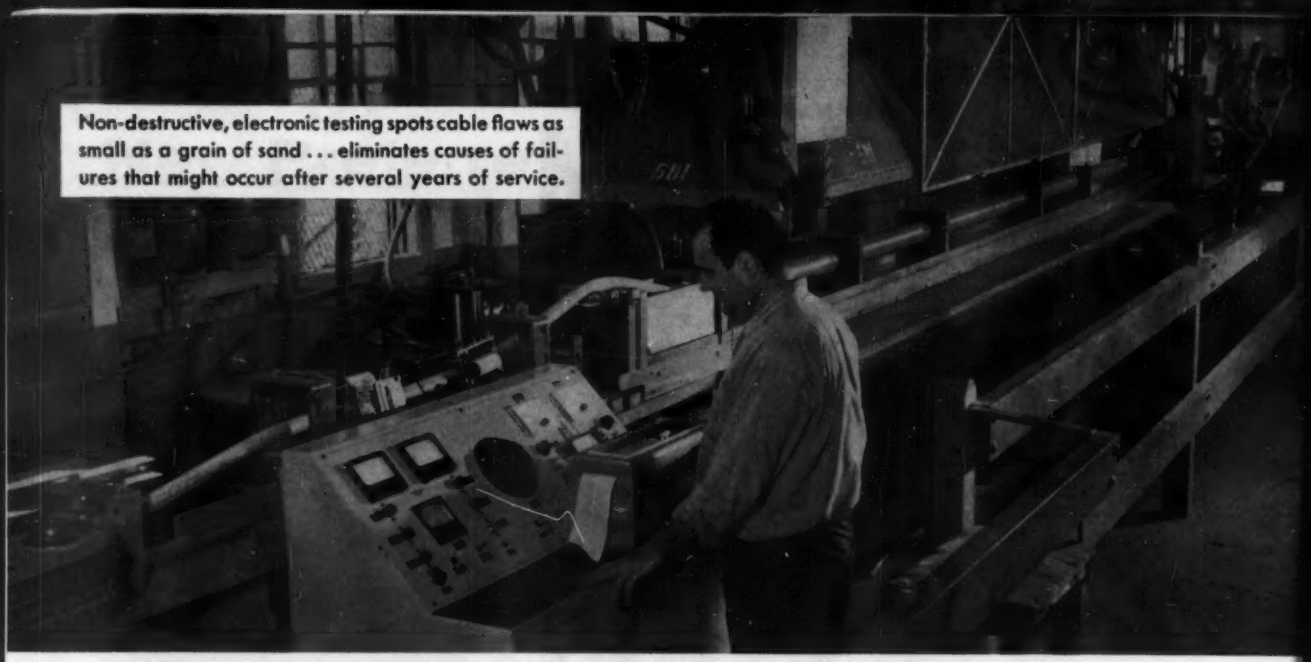

Non-destructive, electronic testing spots cable flaws as small as a grain of sand . . . eliminates causes of failures that might occur after several years of service.

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The Gooding Test Train, an Okonite development, can literally peer through every inch of solid dielectric cable to pinpoint flaws for removal or correction.

Two years' experience in regular production has proved that the Gooding Test Train detects flaws heretofore unrevealed even by the highest industry voltage tests or full-reel corona tests. Now that this valuable method of quality control has been thoroughly established, Okonite has extended its testing range to all strip-insulated cables rated above 2kv.

The entire cable passes through a series of three test units which provide unequalled assurance of successful service. The Gooding Test Train is used on strip-insulated cables in addition to Okonite's self-imposed, factory high-voltage acceptance tests which exceed industry specifications.

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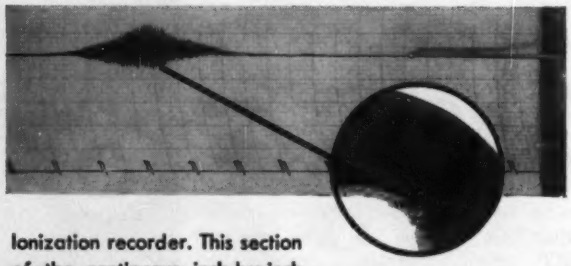

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For additional information about this revolutionary testing method, write for Bulletin EW-1100. The Okonite Company, Passaic, N. J.

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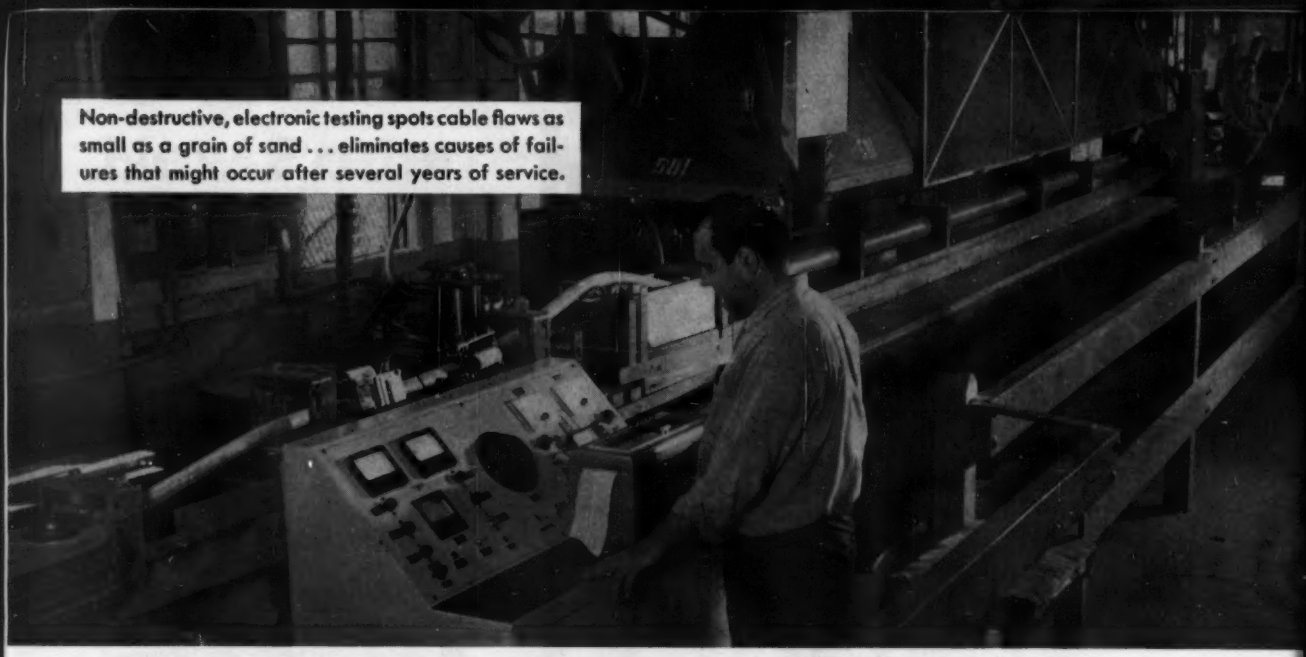

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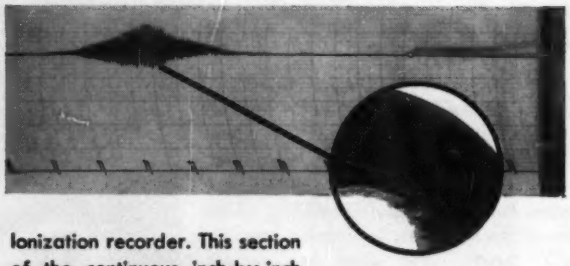

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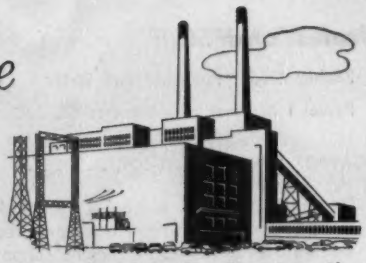
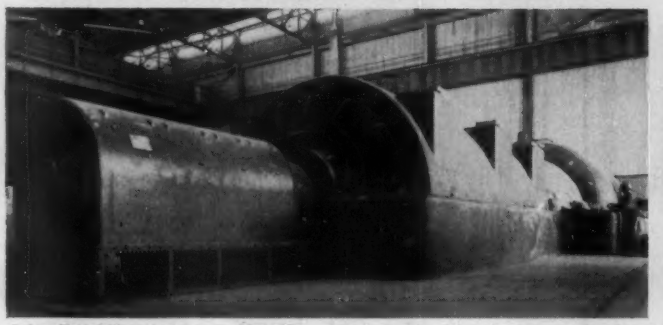
Grinnell provides *complete fire protection* for vital areas at Detroit Edison Company

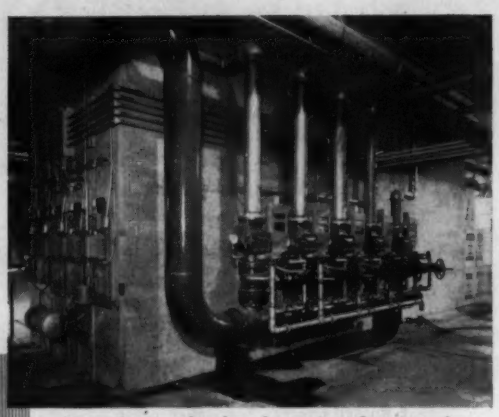


Pictures below taken at River Rouge Power Plant of Detroit Edison Company.

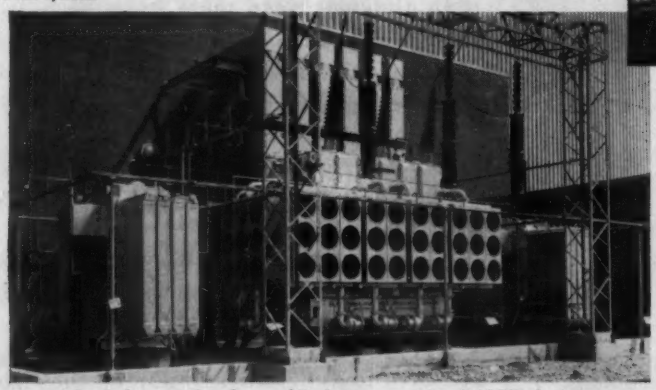
GRINNELL MULSIFYRE SYSTEM FOR EXTINGUISHING OIL FIRES



Grinnell Mulsifyre System provides efficient protection for hazardous areas of turbine lubrication system.



Automatic control valves for various fire protection systems throughout station.



Around-the-clock protection for world's largest capacity (315,000 kva) generator transformer provided by Grinnell Mulsifyre System.

Complete extinguishment of fires within areas protected by Grinnell Mulsifyre is usually obtained in a matter of seconds after water discharge starts. Case histories prove that Mulsifyre projectors are effective wherever the danger of fire in medium or heavy oils can be limited to a definite area. In these oils the surface emulsion remains to give after-protection against flashback. Detailed information on Grinnell Mulsifyre will be sent on request.

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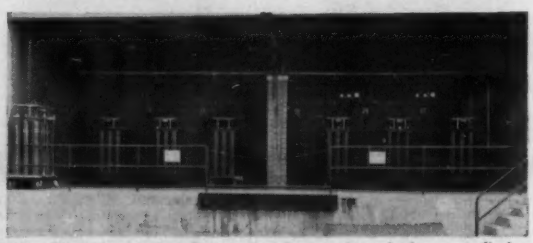
Flammable gases having wide explosive limits require protection against input heat when stored under pressure to prevent bursting of the containers. Hydrogen gas, with explosive limts of 4 to 75 percent when mixed with air, requires protective cooling whenever and wherever its container faces the danger of exposure to possible fire or heat from fire.



Grinnell ProtectoSpray System stands guard at hydrogen cylinder storage dock.

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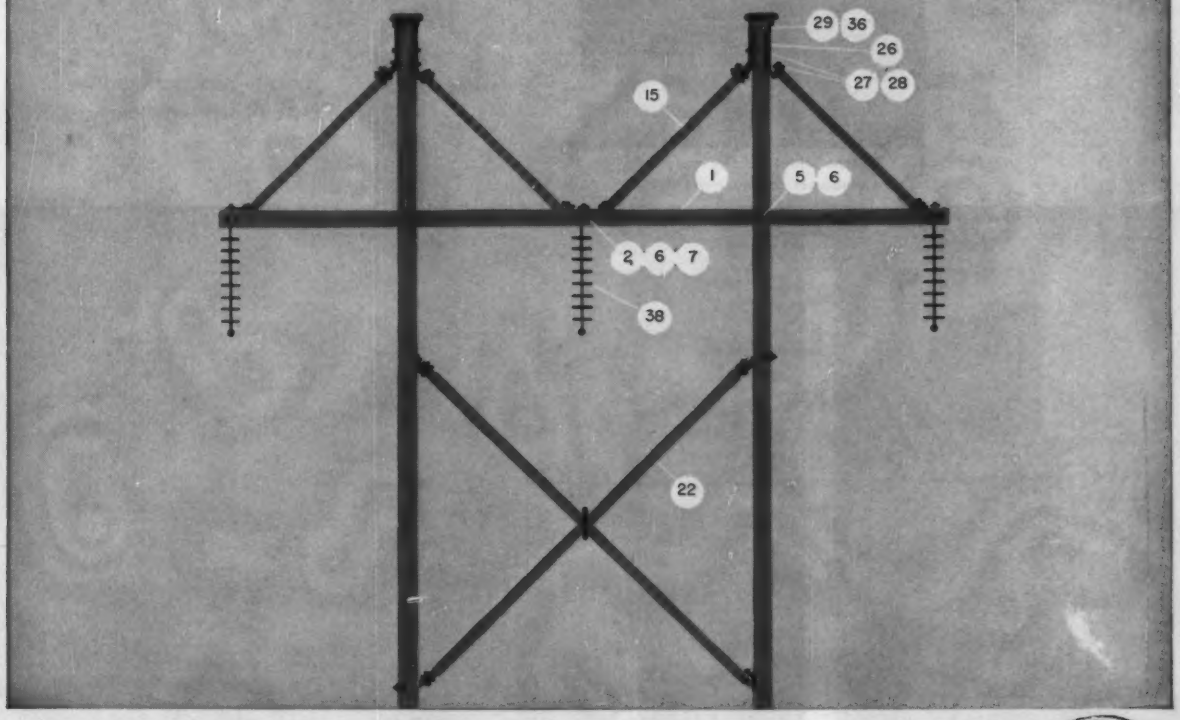
DRG. REF. #	QUANTITY	DESCRIPTION	DRG. REF. #	QUANTITY	DESCRIPTION
792	2	Pole	15	4	Vee brace 3⅜" x 4⅜" cross section
1	2	Crossarm	22	1 set	Cross brace w/fittings, clamp, ⅞" pole bolts and curved washers
2	3	Steel spacer fitting w/mounting bolts	26	2	Static wire support
5	2	Stud bolt ⅞" w/washer nuts	27	4	Machine bolt ¾"
6	8	MF locknut ⅞"	28	4	MF locknut ¾"
7	1	Bent stud bolt ⅞" x 8" w/2 sq. nuts	29	2	Clevis
			36	2	Suspension clamp for static wire
7	2	Bent bolt ⅞" x 5½" w/sq. nut	38	As required	Suspension insulators and fittings



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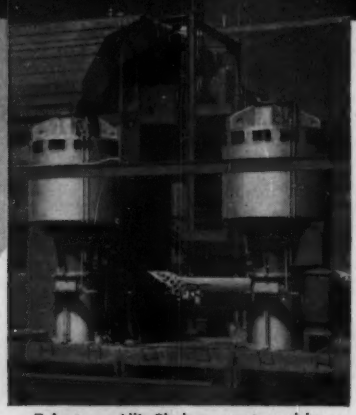
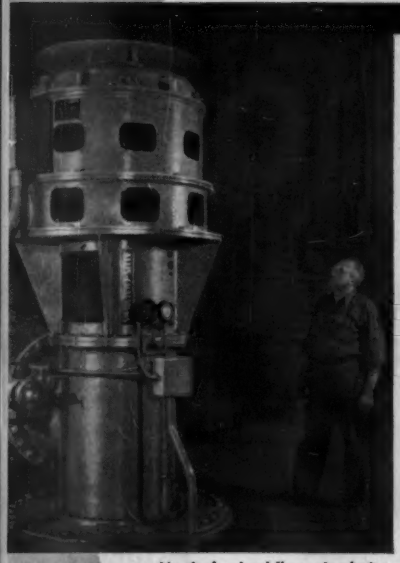
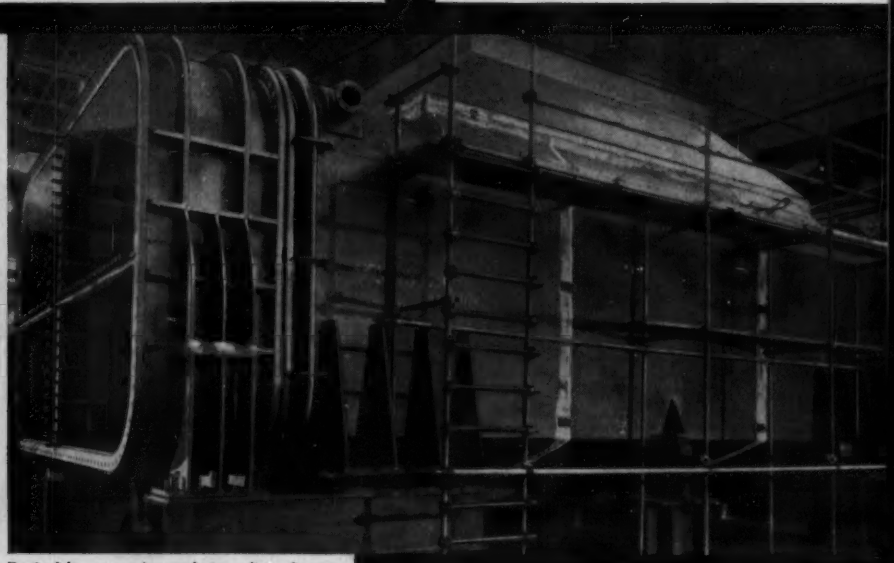


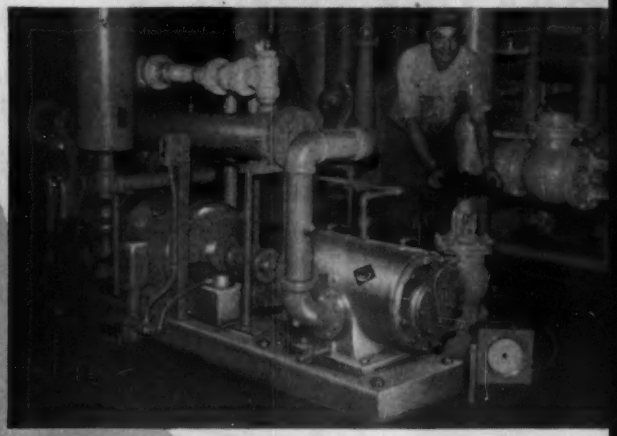
Tube-type Allis-Chalmers motors driving condenser cooling water pump.



Vertical mixed-flow circulating water pump and motor.



Typical large condenser being aligned in shop prior to shipment.

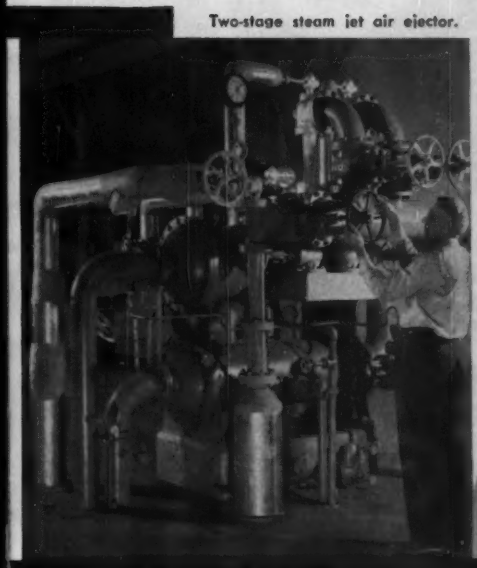


Two-stage rotary vacuum pump.

Condensate pumps and motors.

"ball of wax"

from Allis-Chalmers



Two-stage steam jet air ejector.

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For A-C builds the condenser with its auxiliary apparatus, including pumps, motors, air removal equipment, switchgear, etc. Moreover, the experience in building millions of square feet of condensers of every size, shape and type enables Allis-Chalmers to meet your special conditions with a high efficiency, high vacuum installation.

for information about Allis-Chalmers condensing equipment, call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

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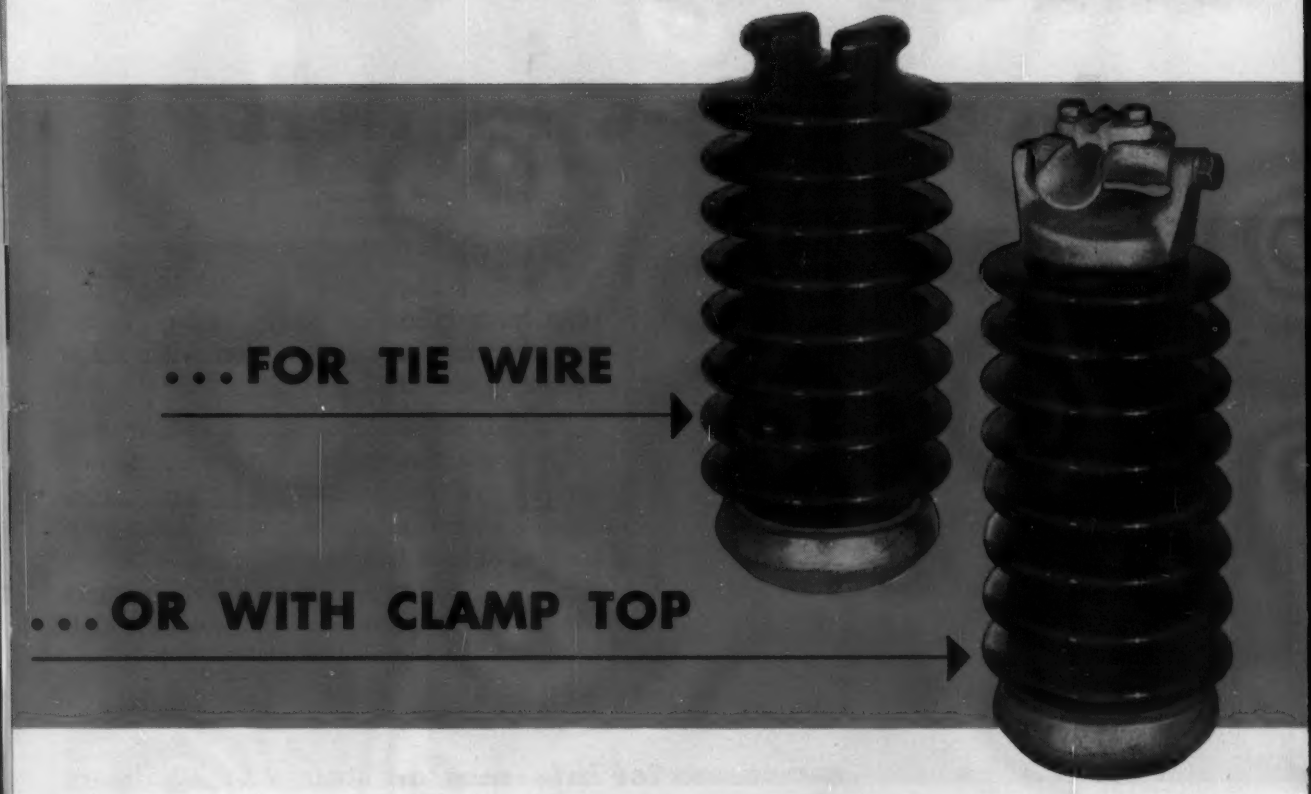
Lapp builds the Line Post

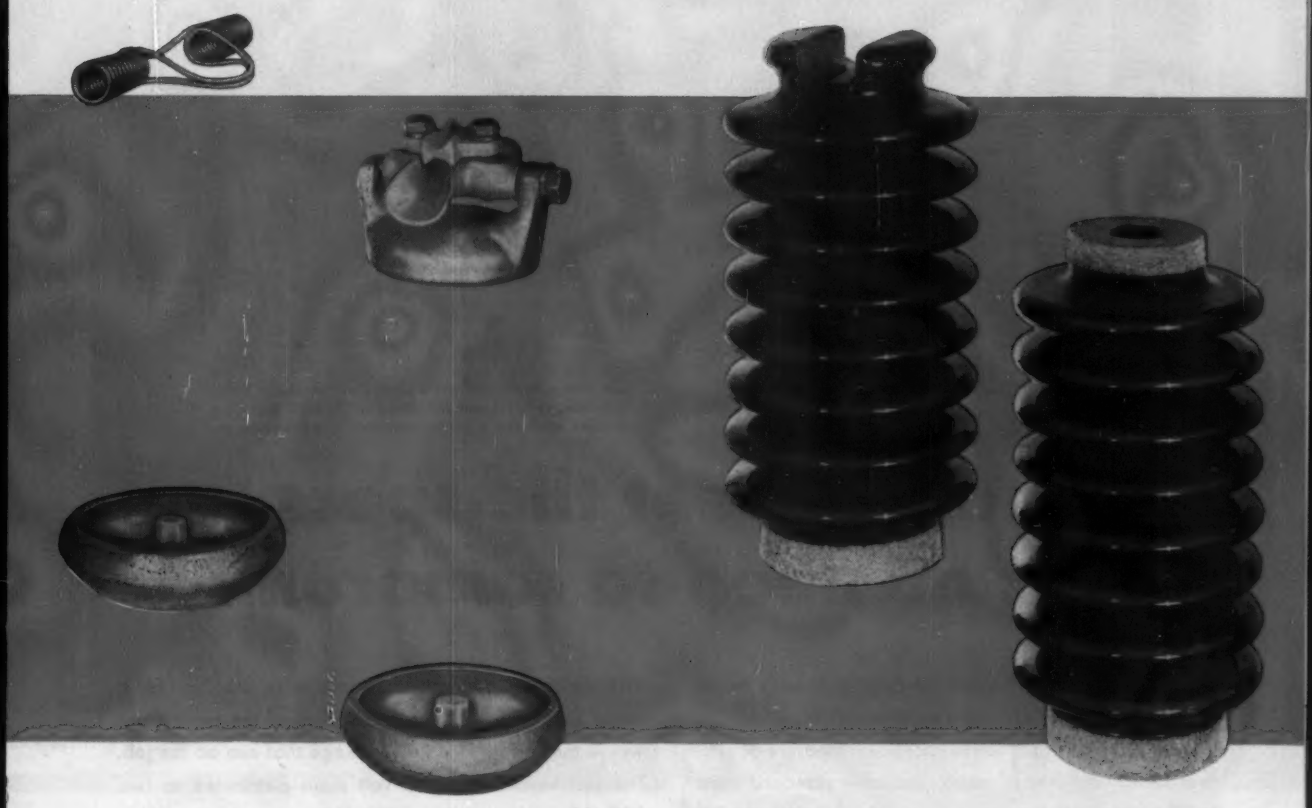


Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

This is the hardware

This is the insulator



For tie-wire installation, the Lapp Line Post provides a deep, square-side top groove. Such an installation provides a "mechanical fuse"—the conductor can slip through to relieve structure load in case conductor breaks.

With clamp-top assembly, the Lapp Line Post provides for easiest installation or change-out of any clamp-top design. A single cap screw with captive washer is the only loose part throughout installation. For change-out, the clamp stays on the conductor. All clamps are interchangeable on all sizes of Lapp Line Posts

In either type of assembly, the tie-wire, the base or the clamp top are mechanical parts. Their function is only to attach the conductor to the insulator and the insulator to cross arm or pole—and to provide such attachment in a way that will permit the insulator to do its job faithfully.

With either tie-wire or clamp-top construction, the *insulator* is the porcelain post. It is a closed-end post of Lapp electrical porcelain of fog-type design. Its uniform long leakage path prevents leakage flashover in contaminated atmosphere. It has exceptional stamina under arcover and attack by stones and bullets because short, strong petticoats protect its sturdy body. It won't puncture because it has no conductive material within it. It won't crack, because its hardware . . . top and bottom . . . is *externally* attached, and can load the porcelain only in compression.

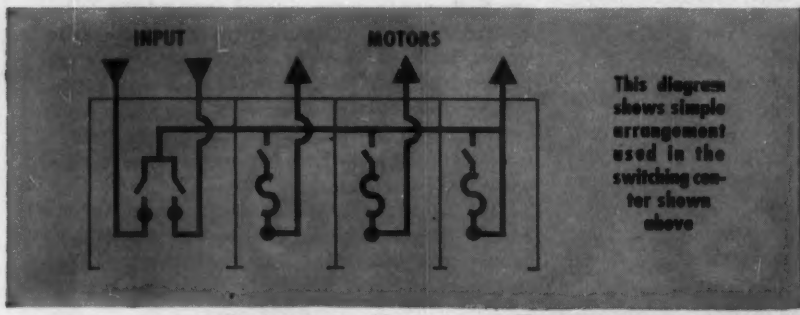
The Lapp Line Post will improve your service record and your maintenance record by providing an *extra* margin of operating security, low upkeep and long life.

The man with his coat off is Carl Christiansen, 3E Sales Engineer, pointing out the features of a 3E Switching Center built for a large automobile manufacturer.

3E builds to meet the specs . . .
. . . *no need to compromise*

3E engineering and standard components solve a wide range of unique requirements.
There is often a temptation to sacrifice a measure of efficient design in favor of easily available standard units. At 3E we believe that equipment engineered to fit job requirements without compromise is not only economical —it is the best way to protect *your responsibility for safe precise control of power.*

The switching center shown above was built for a major auto manufacturer. It is typical of the many cases where there is *no standard package* that can do the job. The unit handles a 4800 volt input distributed to two 300 H.P. motors and one 200 H.P. motor used to drive high frequency generators. The use of 3E's **Auto Speed Load Interrupter Switches** and 3E design produced a compact, rugged switching center at a practical cost.



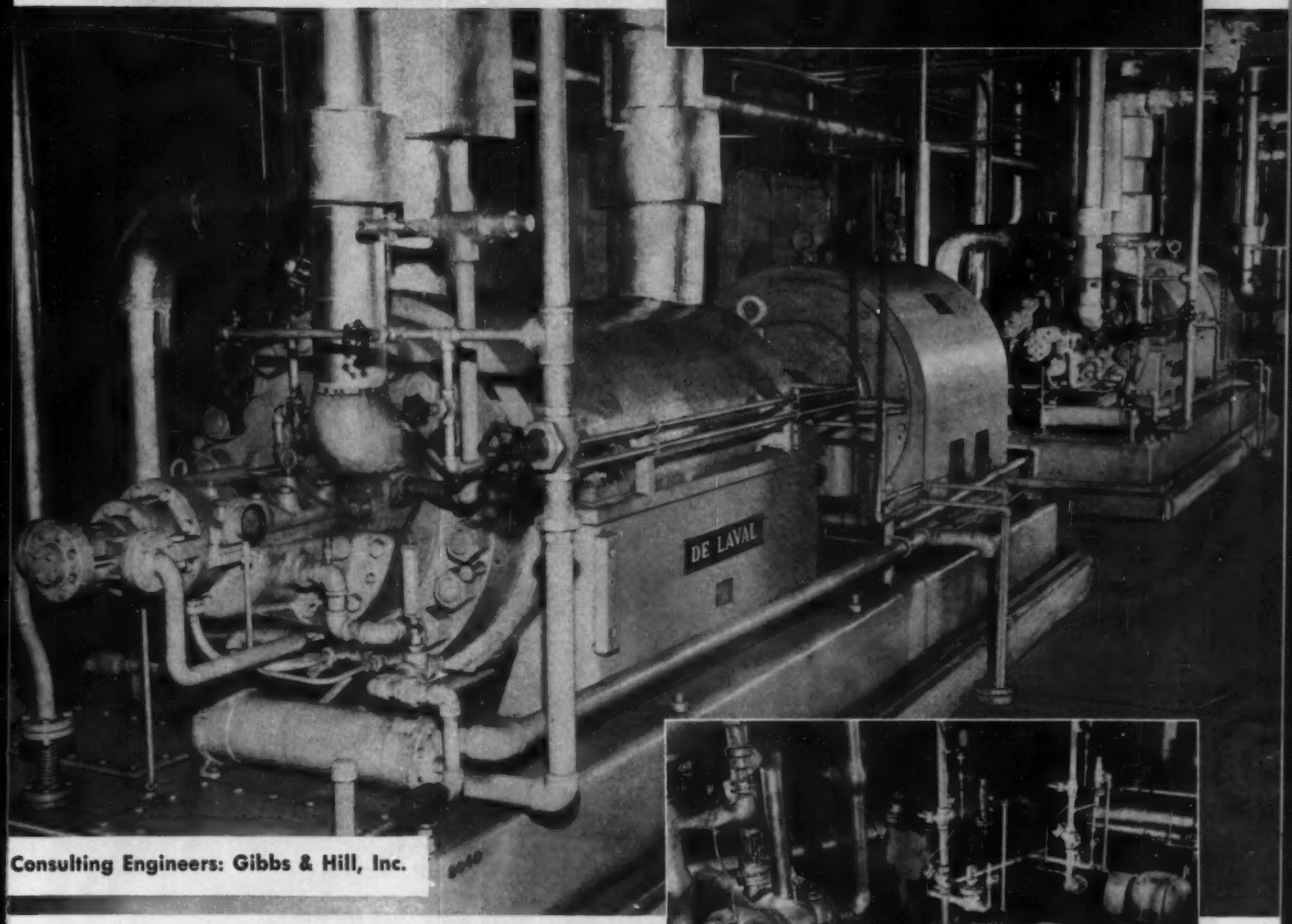
This diagram shows simple arrangement used in the switching center shown above

3E

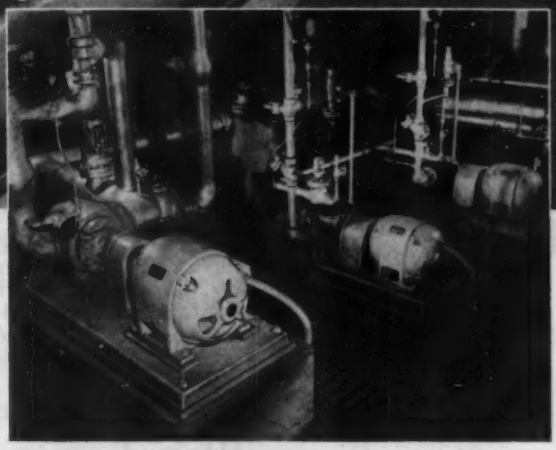
ELECTRICAL ENGINEERS EQUIPMENT CO. Melrose Park, Illinois
Representatives in principal cities—in Canada by Power-Lite Devices, Ltd.

Atlantic City Electric ... another utility using

DE LAVAL
BARREL TYPE
BOILER FEED PUMPS



Consulting Engineers: Gibbs & Hill, Inc.



De Laval IMO rotary positive displacement pumps handle heavy fuel oil. They are used for standby operation.

Atlantic City Electric Co. and Gibbs & Hill, Inc., Consulting Engineers, know that they can count on De Laval reliability. That's why they selected three De Laval high pressure barrel type boiler feed pumps for the Deepwater Station in Penns Grove, New Jersey. These 10-stage units deliver 675 gpm, operating at 1762 psi with temperature at 287 F. The pumps are driven by 900 hp motors.

De Laval barrel type boiler feed pumps operate at pressures up to 5500 psi. These units offer many important design advantages, such as double volute diaphragm, individual diaphragm bolting, only one inner high-pressure joint, and bare shaft construction. Their dependability is proven by year in, year out service in public utilities and industrial plants.

Send for De Laval Bulletin 1506, which contains helpful data.

DE LAVAL *Boiler Feed Pumps*

DE LAVAL STEAM TURBINE COMPANY
861 Nottingham Way, Trenton 2, New Jersey

at NEW LOW PRICES!

These prices mean new economy for you, because they make the annual cost of Copperweld* Guy Strand even less than before—and it always has cost less per year of service than ordinary strand.

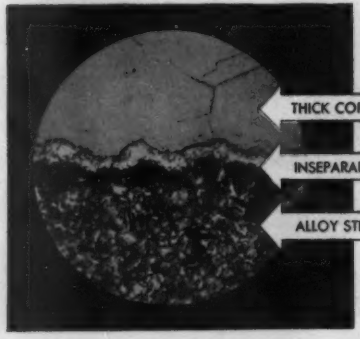
Copperweld Type M Guy Strand is easy to handle. It is flexible and pliable—can be readily bent, served, moused or clamped. The heavy copper sheath of each wire, inseparably molten-welded to the alloy steel core by the exclusive Copperweld process, will not crack, flake or peel.

Seven strengths are available: 3-wire strand in strengths of 2.2M and 4M; 7-wire strand in strengths of 6M, 8M, 10M, 12.5M and 16M. Start now to save more by using Copperweld Type M Guy Strand. Our field engineers will be glad to tell you about it.

*Trade Mark

COPPERWELD STEEL COMPANY WIRE AND CABLE DIVISION *Glassport, Pa.*

For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York



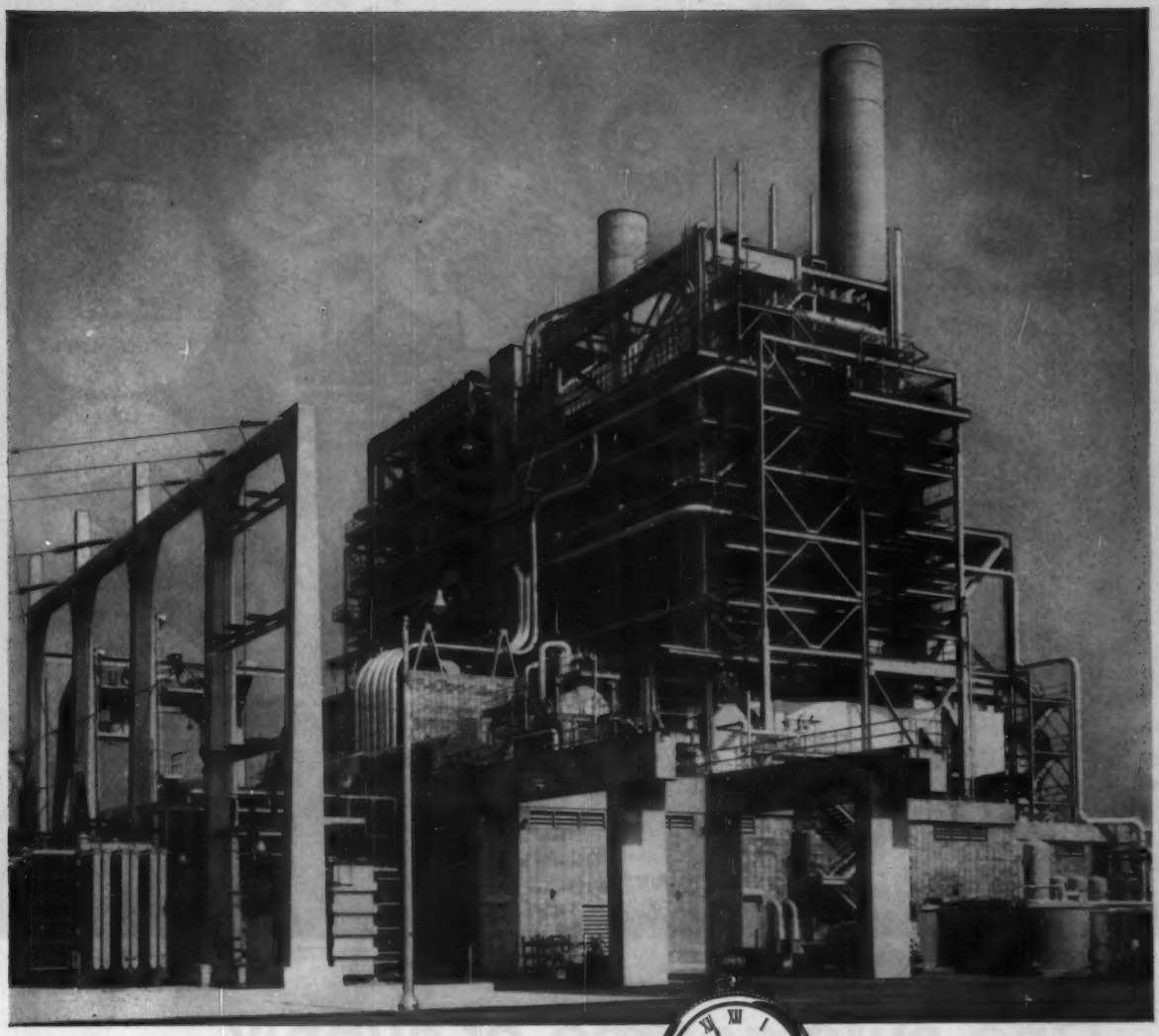
microphotograph of weld area of Copperweld Wire, greatly enlarged

—AND REMEMBER,

THE MOLTEN-WELD

MEANS

proved dependability and long life



LIKE TO KNOW THE TIME?

Nineteen months after engineering started, the first of two 156,250 kw turbine generators in Southern California Edison Company's new Alamitos Steam Station (near Long Beach) was in operation. The second unit went into service 6½ months later.

This rapid schedule was made possible by close cooperation between the owner and Bechtel Corporation, the engineer-constructor.

Other facts that make Alamitos newsworthy include: over-all economy of the project; design flexibility permitting future expansion; and the fact that its 312,500 kw output is a significant part of an expansion program that has increased Edison's steam generation capacity over three times in ten years.

BECHTEL CORPORATION *Builders for Industry*
SAN FRANCISCO · Los Angeles · New York · Houston
CANADIAN BECHTEL LIMITED, Toronto · Vancouver

One sure source of supply

for all your wire and cable needs

FROM MINE! The Circle wire and cable you use starts out thousands of miles away high in the Peruvian Andes in South America. There, in Cerro de Pasco's mines, smelters and refineries, such metals as copper, lead, zinc and many others are processed and shipped North . . .

TO CIRCLE! Extensive manufacturing and testing facilities enable Circle to produce one of the broadest lines of building wire and cable. Through a large network of responsible distributors and well-stocked nearby warehouses, Circle provides unmatched service and deliveries . . .

TO YOU! Though one of the nation's largest producers, Circle avoids "red tape" — makes every effort to give all customers immediate attention. That's why your Circle distributor is your best assurance of dependable supplies. Circle Wire and Cable Corp., 5500 Maspeth Ave., Maspeth, N. Y.

CIRCLE WIRE & CABLE
a subsidiary of
CERRO DE PASCO CORPORATION

PLANTS: Maspeth and Hicksville, N.Y. SALES OFFICES: In all principal cities.

RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES • NEOPRENE SHEATHED CABLES

New Wiring Calculator — FREE!

Send today for this useful wiring aid. Gives conduit sizes, amperage capacities, and motor running data. Write Dept. B6.

What do you get when you light your streets with new General Electric "Power-Groove" Lamps?

First and foremost, you get *more light* from a new General Electric "Power-Groove" Lamp . . . 65% more light than you get from a High-Output fluorescent tube of the same length. This extra light provides you a choice of three big opportunities.

1. You can put *more light* on the street.
2. Or . . . you can use fewer G-E "Power-Groove" Luminaires and get the same amount of light. And fewer luminaires mean fewer lamps, fewer parts to maintain, lower initial cost.
3. Or . . . you can use *smaller luminaires* and get the same amount of light. (For instance, you can get as much light from a 2-lamp *4-foot* "Power-Groove" Luminaire as you get from a 2-lamp *6-foot* High-Output luminaire!)

Three G-E "Power-Groove" Luminaires are now available—the 2-lamp *4-foot*, the 2-lamp *6-foot*, and the 4-lamp *6-foot*—from 8,600 to 37,200 lamp lumens.

So, if you are planning to modernize or extend your street lighting installations, check further into the important benefits offered by General Electric "Power-Groove" Lamps. For more detailed information, write: General Electric Co., Large Lamp Dept. EW-67, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

SAFER STREETS usually have highest levels of light. Notice that there are no dangerous areas of darkness on this street . . . lighted by G-E Fluorescents that provide a soft, pleasant, safe light.

Now for "Preferred-Emergency" Switching

an Off-the-Shelf

AUTOMATIC TRANSFER PANEL

With *Any Desired* Throwover Scheme ...at the *Flip of a Switch!*

A Flip of the Switch Gives You:

- Choice of making either source preferred.
- Choice of automatic or manual (semi-automatic) return.
- Adjustable time delays —range up to 10 minutes.
- Optional manual operation of line switches.
- Choice of returning: in either open or closed transition (with or without paralleling).
- Optional lockout on bus faults.

Other Unique Features:

- Indicating lamps for switch positions, live sources, and lockout action.
- Alarm to prevent leaving panel set on "manual operation."
- Transparent cover over selector switches prevents unintended changes in settings.

Saves Time and Money

You don't have to design and build (or negotiate for) — your special automatic transfer panels in order to get the special specific throwover schemes you need. The new S&C Automatic Transfer Panel will give you any or all throwover options... selector switches give the scheme you want!

With this new stock panel you can eliminate the engineering and correspondence involved in getting custom-built panels.

Furthermore, you are sure of getting what you want today; tomorrow you can change your mind, and later you can revise the scheme—still using the same transfer panel. Imagine! You can order your panel ahead of time, before specifications are settled.

— Buy from our stock for your stock —

Specialists in High-Voltage Circuit Interruption since 1910

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

NEWS-SCOPE

FUTURE NEWS ▶ **"Tax-paying" vs "sub-sidized" power looms as the key issue** in the move to build a rural co-op generating plant in Indiana to meet needs of a proposed aluminum plant. Sides are lining up for rough battle.

President Eisenhower's new nominee to the TVA board may just as well expect rugged questioning by Senators who must confirm the appointment. Reason: They want to be sure he is in full accord with the purposes of TVA as they interpret them.

Premiere of new sound movie "The Atom Comes to Town" is scheduled for late June. Made by the Chamber of Commerce, the film will sketch atomic contributions to industry and medicine.

LATE NEWS ▶ **Administration split, over granting fast tax write-offs to Idaho Power** for construction of two dams on Snake River, is revealed at Senate judiciary subcommittee hearings. Investigation disclosed that Interior Secy Fred Seaton recommended denial of the write-off but ODM Chief Gordon Gray later approved it . . . Meanwhile, Supreme Court for second time supports FPC's license to Idaho Power.

Rate reduction of 17% for electric house heating is granted Kansas G&E by Kansas Corporation Commission. Reduction, lowering kwhr cost from 1½ to 1¼ cents for residential users, is second this year. KG&E also established a 1¼ cent rate for electric heating for commercial and industrial users.

FPC finds that a group of electric companies incorrectly charged the expense of two pamphlets that have been the subject of investigation by Rep Earl Chudoff (D-Pa.). FPC ruled that "The Federal Program" and "Turn on the Lights" bought by 59 companies were charged as operating expense and therefore included in the rate base—whereas they should have been accounted for under "miscellaneous income deductions" and not chargeable to rates. But FPC also found the amounts were so small they "could not have any significant effect on rates." (See earlier story, p 70).

Bill to create an Oregon power distribution agency dies in state Senate. But state voters will decide in 1958 on creation of a limited power commission. The body would sell power to industrial users of over 10,000 kw and build thermal and nuclear power plants.

Halsey, Stuart & Co wins $3 million Community Public Service first mtg 5⅜% bonds due 1987 with a bid of 100.14%; reoffers at 101.875% to yield 5.25%.

Congratulations . . . Northern States Power Co's Robert H. Engels rises from assistant to Pres Allen S. King to vice president . . . Andrew J. Haswell is a new vice president at Oklahoma Gas & Electric Co . . . C. R. Stockhus is elected a vice president of Union Electric Co and continues as labor relations director . . . General Electric Co ups Clyde A. Lilly, Jr, to manager of marketing of the large steam turbine-generator department.

ELECTRICAL WEEK

A TWO-MINUTE

EVENTS ▶ **Industry trims back peak load estimates, defers additions,** latest EEI power survey shows. But both summer and winter margins of capability over peak load are now estimated to be wider than they were at time of previous survey in November. According to present plans, nearly 17-million kw of capability will go on lines next year (p 68).

Nation's first supercritical steam unit goes into service. It is American G&E's 120-Mw, No. 6 unit at the Philo Station downstream from Zanesville, Ohio. It was shoe-horned into space formerly occupied by a 40-Mw unit (p 72) . . . Electrical Historical Foundation is formed to keep tally on industry's historic relics and encourage preservation and display of such items (p 73) . . . Tornado rips utility lines in Kansas City area (p 71).

WASHINGTON ▶ **Congressional committees begin probe of advertising** by electric companies to determine whether it is to be classed as business expense. Sen Estes Kefauver (D, Tenn.) directs investigation in Senate (p 70).

ATOMIC PROGRESS ▶ **Burnup of some 10,000 Mw per day per ton** without excessive U^{235} enrichment is indicated by Sargent & Lundy study of large uranium-thorium, heavy water (D_2O) reactors. Estimated total power costs of BWR using D_2O as coolant and moderator is 13.1 mills per kwhr for 60-Mw plant and 15.4 mills for 40-Mw unit. Capital costs per installed kw are $226 and $301, respectively (p 80).

DISTRIBUTION ▶ **Hot-line maintenance is commonplace on distribution circuits** of Pennsylvania P&L, giving a healthy boost to service continuity. One secret of success for the utility is the coordinated operations, training, and tool development program which has been in effect since the Thirties. Methods and tools have been sufficiently standardized to foster a comprehensive manual for such work (p 86).

Matching crossarm life to pole longevity could pay off handsomely. But it's easier said than done Detroit Edison has learned in experiments to determine how long crossarms should last. Long-life treatment per EEI specs may run about 15% of arm cost. Replacement, though, runs about three times what the material cost (p 84).

Network protectors developed for 216-v are adaptable to 480-v, provided controls and fuses are changed accordingly. Capacity gain enhances economies of 480 v in commercial-load areas (p 90).

SUBSTATIONS ▶ **Transformer loading capabilities, maximum oil temperatures** are topics for this week's Engineering Reference Sheet. Data are adapted from Oklahoma G&E practices. They can serve as guide for compilations if you're located outside South Central area (p 96).

METERING ▶ **To gang test nipplebase water heater time switches,** Detroit Edison pressed into service an ordinary rack truck. Hanger studs of truck

were welded to steel strips. After bolting studs to corresponding row on the opposite side, hanger rows were connected with a common ground wire. Test runs are made for 12, 18, or 24 hr (p 95).

HEATING & COOLING ▶ **Talk about a dog's life.** Sacramento MUD serves up to 700 kwhr a month for an animal clinic with electric heat, deodorizing lamps, fluorescent lights, and exhaust fans . . . Third annual "Coolerama" drew 15,000 Long Island Lighting prospects for six-day show (p 106).

SELLING ▶ **"Seeing is believing."** That's the formula for commercial cooking prospects. EEI conference proves you have to show 'em to sell 'em (p 76) . . . Local dryer saturation gets a 1.7% boost after promotion of free wiring setup by Kansas P&L dealers and distributors (p 104) . . . Change from permanently connected motors to a plug-in bus duct distribution system boosts productivity while saving time and money for manufacturer (p 108).

MANAGEMENT ▶ **June calendar for new security financing is "very full,"** especially the first week. Some $275 million will be sold next month and there will be a good balance between debt preferred and common . . . "All power groups . . . must do their share in providing their own power resources" to meet Pacific Northwest needs through 1967, says Pacific Northwest Power Co spokesman. An estimated $3.2 billion will be needed for new facilities in the area by then (p 121).

PEOPLE ▶ **At Minnesota P&L, Axel H. Herbert is elected vice president** and named assistant general manager . . . At Dallas P&L, P. M. Rutherford, Jr, is elected vice president and retains duties as commercial manager . . . At Southwestern G&E, Robert F. Scott is a new vice president . . . At Black Hills P&L, Harry Z. Babbitt is appointed chief engineer (pp 130, 131).

MANUFACTURERS ▶ **Expansions give Line Material a 35% boost in output of fibre conduit and fittings.** Additions at Baron, Wis., and Sherman, Tex., include equipment for making bituminized fiber fittings and 10-ft lengths of fibre conduit . . . Elliott Co announces sale of 33,000-kw turbine generator to Corn Belt Power Co-op. It's the largest unit made by the company since it decided to manufacture equipment of higher ratings (p 127).

NEW EQUIPMENT ▶ **Two-legged hydraulic derrick handles heavy loads** in low ranges and has body loading capacity up to 4,000 lb. It has power feed attachments for the digger. A double-acting cylinder serves as boom head which, when extended, adds 5 extra feet and permits handling of poles up to 75 ft . . . Line of dry type distribution transformers for voltages through 600 v announced . . . Hot stick insulating handles, a standardized switchboard, and nutless cable clamps are among other items new on the market (p 110).

ENGINEERING TRENDS

Violent chemical reactions between nuclear fuel and the water of water-cooled reactors is less likely when the fuel is in the form of oxides of uranium or thorium.

Soft lead bonds between nuclear fuel and its cladding may help to absorb dimensional changes in fuel elements caused by radiation and thus bring about longer burn-up times for the fuel elements.

No inverse-time relay can eliminate all line burndowns, even with the fast circuit breakers recently introduced. Extremely inverse relays do not completely solve this problem which will face every utility as its service areas approach really high load densities.

Microwave equipment will have longer operating life with better ventilation of its cabinets and positive lubrication of the bearings for blowers which cool the transmitter tubes.

Hurricanes are simulated in water models which, when warmed at the center, cooled on the outside, and rotated slowly, break into small whirlpools. Such tests help University of Chicago weathermen to analyze storm problems.

Impregnated plastic films withstand high discharge inception stresses when used as insulation, according to basic research in England reported by Electrical Review.

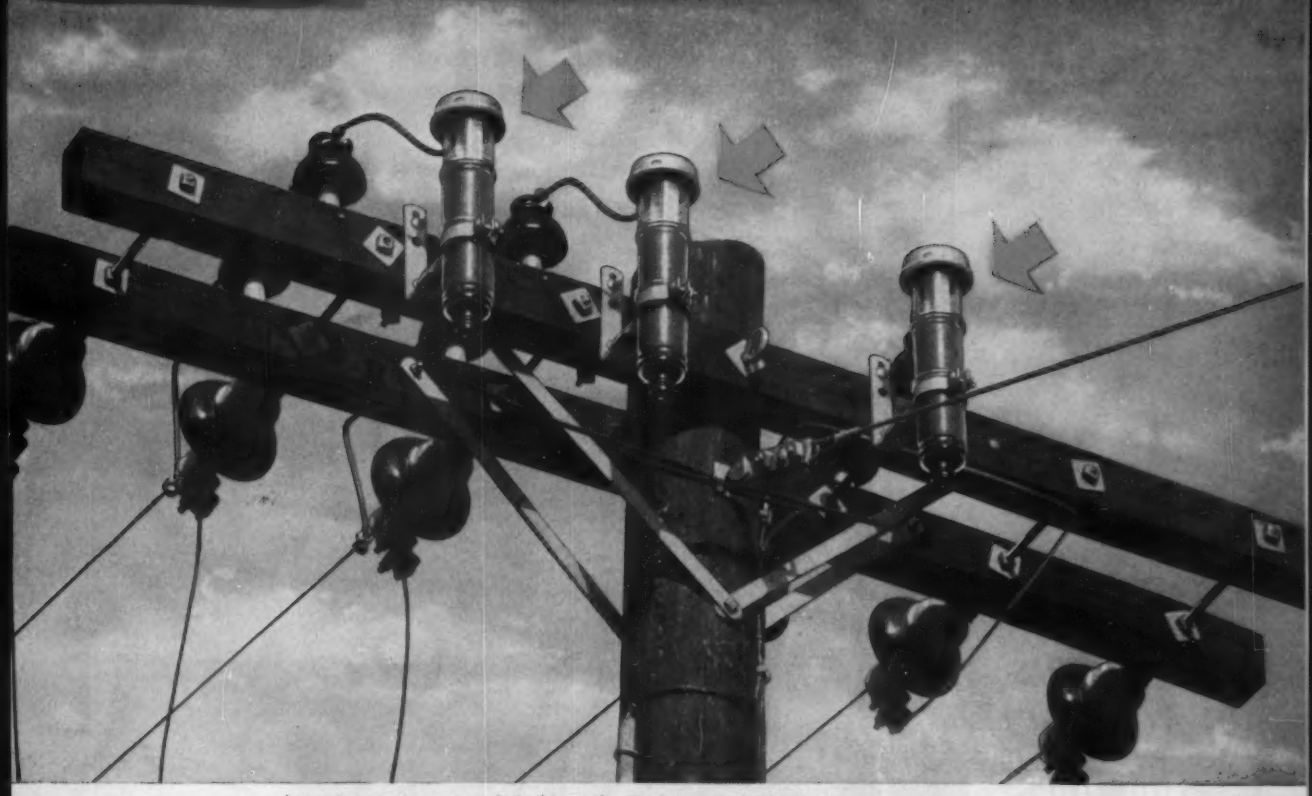
Utilities Radio Service is designated by FCC as the classification under which electric utilities will use their radio systems. Present users will follow closely deliberation by the commission of proposals to split assigned channels and isolate utilities from industrial, transportation, and other groups, as well as bids of communication carriers for more channels in the utility radio bands.

Slightly porous fuel elements of enriched uranium oxide provides voids in which gaseous fission products can accumulate without causing undue distortion of the fuel assemblies.

FROM EDITORS IN THE FIELD

Accidents off the job outnumber on-job accidents 45 to 1 for 900 employees of Oklahoma G&E Co, despite the fact that off-job time is only about twice the working time. This difference in accident rate is attributed to competent and efficient supervision over their work.

Inflatable rubber cushions on coal-chute steel plates cut down stoppages for South Carolina E&G Co. Air pulsates the rubber from zero to 5 psi 12 times a minute, alternating automatically between inflation and deflation. Coal handling has proved quieter and less costly.



L-M valve arresters are not limited in application by the available short-circuit current; pass only small values of follow current regardless of system capacity. Heavy-duty spark gap transmits severe discharges without burning or pitting, and allows the arrester to go into action fast.

Eleven-year operating records show...

99.96% Performance Record For L-M Valve Arresters On Utility System

Eleven-year operating records of a large midwestern utility show that L-M valve-type lightning arresters have an outstanding performance record. During this time, L-M valve arresters have accumulated 138,110 service years on this system, and only 51 of these arresters have failed during this span as evidenced by proper functioning of the isolator. Of the 1,873 L-M arresters removed from service because of system changes, all were passed by the utility's electrical test and inspection department and returned to stock.

Positive Protection

L-M valve arresters provide optimum balance between 60-cycle sparkover and impulse sparkover. Heavy-duty spark gap transmits severe discharges without burning or pitting, and allows the arrester to go into action fast. L-M's exclusive valve element assures maximum surge discharge capacity and minimum I.R. drop.

The L-M patented Isolator provides positive protection against feeder lockout in the event of an arrester failure. If the arrester should ever become damaged, the Isolator instantly disconnects the ground lead.

Get Complete Information

Ask your L-M Field Engineer for Bulletin LA-2 on L-M's Type E arrester, which gives specific information on arrester design and performance. Or write Line Material Company, Milwaukee 1, Wis. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ont.

Here are the records for the years 1945 through 1955

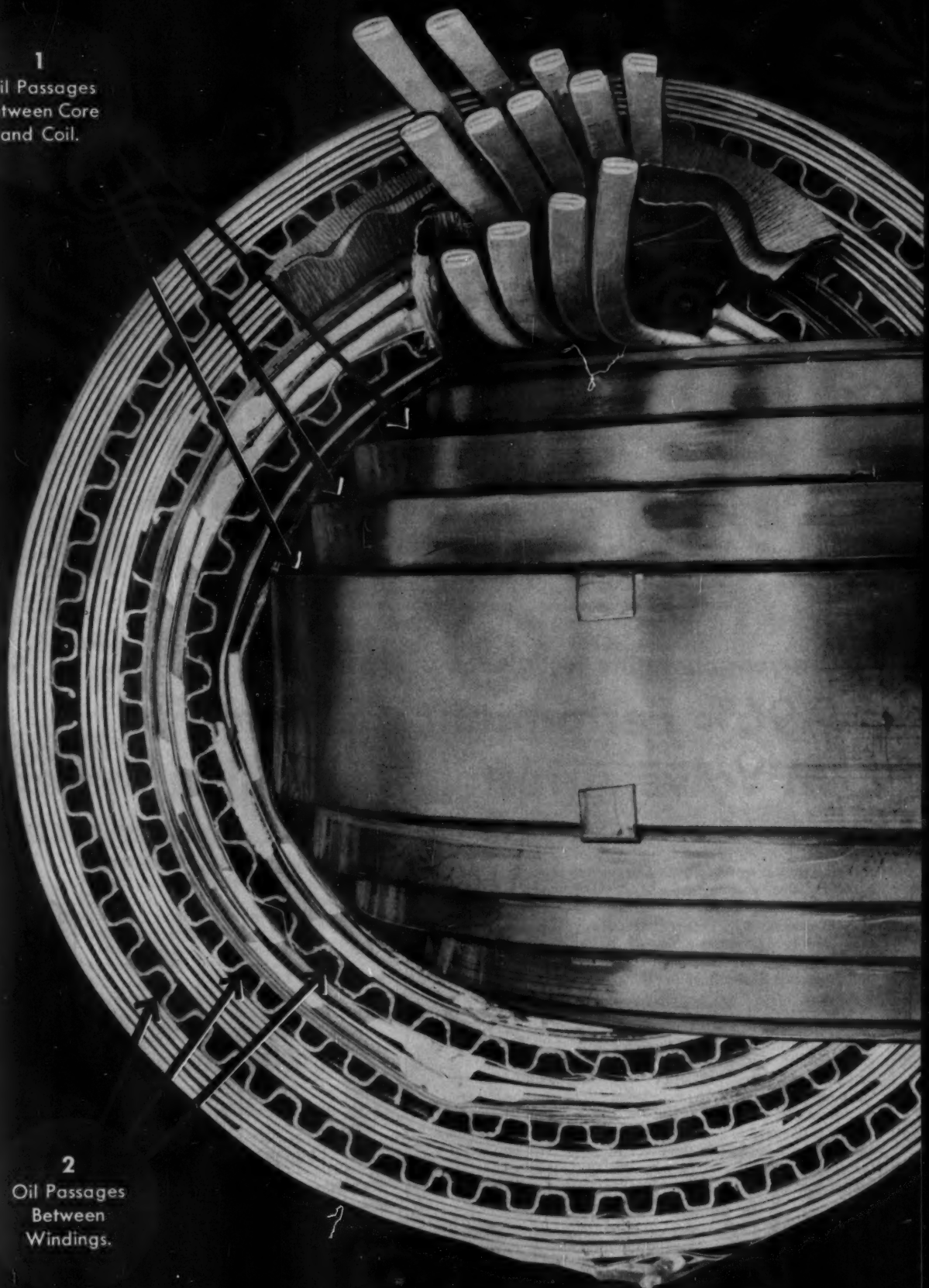
Year	Arresters In Service	Isolator Operations In Service	Arresters Tested	Arresters Failed In Test
1945	3,286	5	0	0
1946	4,322	2	11	0
1947	6,020	2	137	0
1948	7,469	4	118	0
1949	8,686	3	186	0
1950	11,392	7	161	0
1951	13,950	3	270	0
1952	15,282	7	204	0
1953	20,498	13	158	0
1954	21,105	2	383	0
1955	26,100	3	245	0
Total Arrester Service Years	138,110	51	1,873	0

51 ÷ 138,110 x 100 = .036% Failure Rate

279-R

LINE MATERIAL Lightning Arresters

McGRAW-EDISON COMPANY



L-M Round-Wound transformers have large, unobstructed areas exposed to cooling oil between core and coil (1), between windings and layers (2), and on the outside of the coil. The result is appreciably lower hot-spot temperature—high short-time overload capacity.

Here's Why

L-M's Round-Wound® Core-Coil Design Gives High Performance

By A. C. WURDACK
Chief Engineer
Large Distribution Transformers
Line Material Industries

L-M's wound-core, round-coil construction provides the most efficient design for obtaining balanced transformer performance characteristics.

Low Losses

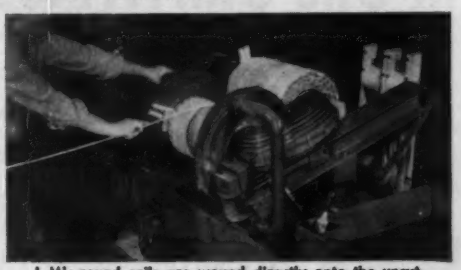
The transformer core consists of a tightly wound, continuous strip of high-grade oriented steel. The core is not cut, unwound, or disturbed in any way after annealing. This results, therefore, in low exciting current, low core loss, and high magnetic efficiency.

Core is wound from strips of steel having several different widths, resulting in a cruciform cross-sectional area approaching an ideal round shape.

L-M's Round-Wound core permits the effective use of a round coil which has a much smaller perimeter than a coil placed around a rectangular core of the same cross-sectional area. L-M's design, therefore, permits smaller turn diameters, resulting in lower impedance and better regulation at all power factors.

High Short-Time Overload Capacity

L-M's Round-Wound transformers have natural oil passages between the cruciform cross-section core and round coil (1) to provide the greatest possible exposure of coil surface area to cooling oil. In addition, duct spacers placed between windings (2) and between layers in most sizes provide additional oil circulation. L-M's core-coil construction, therefore, provides more efficient dissipation of heat from the coils to the oil. The results are lower hot-spot temperatures, and higher overload capacity, or greater over-all life of the transformer.



L-M's round coils are wound directly onto the uncut core. No malleting is required to shape. Long creepage distance between windings and between leads, gives higher impulse strength.

High Short-Circuit Strength

Under short circuits, rectangular coils tend to distort to a round shape, with resultant insulation damage or failure. L-M's round coils are not subject to this distortion when under heavy short-circuit currents, because the coils are already circular in shape. The radial forces are distributed evenly, with little or no effect on the coil. Sturdy clamping structure and varnished coils provide strong mechanical support to prevent axial movement.

Another advantage is L-M's new obround tank design. The transformer is smaller, lighter, and has shorter moment arm distance from the pole.

Get Complete Information

Ask your L-M Field Engineer for complete information on L-M Round-Wound transformers. Or write Line Material Industries, Transformer Division, Zanesville, Ohio.

LM®

LINE MATERIAL Industries

McGRAW-EDISON COMPANY

Transformers

McGRAW EDISON

L-M's New 32-Step Regulator Combines All Desirable Features in One Unit... Plus:

- **reliable, accurate regulation**
- **smooth tap changes, long life**
- **ease of installation and maintenance**

by **N. K. DELANEY**
Product Manager, Capacitors and Regulators, Line Material Industries

Line Material has designed into one compact, efficient regulator all the desirable features found in all other standard makes—plus a few L-M "exclusives."

Sensitive Voltage Control

L-M uses an induction disc-type contact-making voltmeter for reliable, accurate voltage control. The unit is very sensitive, and easily adjustable to a band width of from plus and minus ¾ to plus and minus 6 volts. An integrated time-delay device is used to control the tap-change operation. The time delay can be adjusted independently on both "raise" and "lower" through a range of from 10 to 120 seconds.

Maximum Contact Life

The tap-changing mechanism on L-M's new 32-step regulator is designed to assure smooth operation and maximum contact life. The speed of the tap changer is hydraulically controlled to assure minimum arcing. This, plus a reactor which bridges across adjacent taps during operation, permits smooth tap changes, without current interruption or voltage dip.

Easy to Inspect

The complete internal assembly of the regulator is suspended from the cover to simplify untanking for periodic inspection and maintenance. This desirable feature permits you to inspect all mechanical and electrical parts quickly and easily without draining oil or dismantling the unit.

Less Bending Moment On Pole

The L-M exclusive obround tank design makes the unit smaller, lighter, with shorter moment arm distance from the pole. The unit is easier to handle and install, and the design substantially decreases the total bending moment on the pole.

Greater Current Capacity With ADD-AMP Feature

It is possible to increase the load-carrying capacity of L-M's new regulator up to 160% of its normal rating by reducing the regulation to ±5%. The range of regulation can be reduced externally without de-energizing the regulator.

Get More Information

Ask your L-M Field Engineer for more information on L-M's new 32-step regulator—the regulator with all the best operating and convenience features available on any and all other pole-type regulators. Or write Line Material Industries, Milwaukee 1, Wisconsin.

301

Bushings are corona-free, and are designed for minimum radio interference.

Moving contacts and arcing tips of stationary contacts are made of arc-resistant copper-tungsten alloy to assure long contact life.

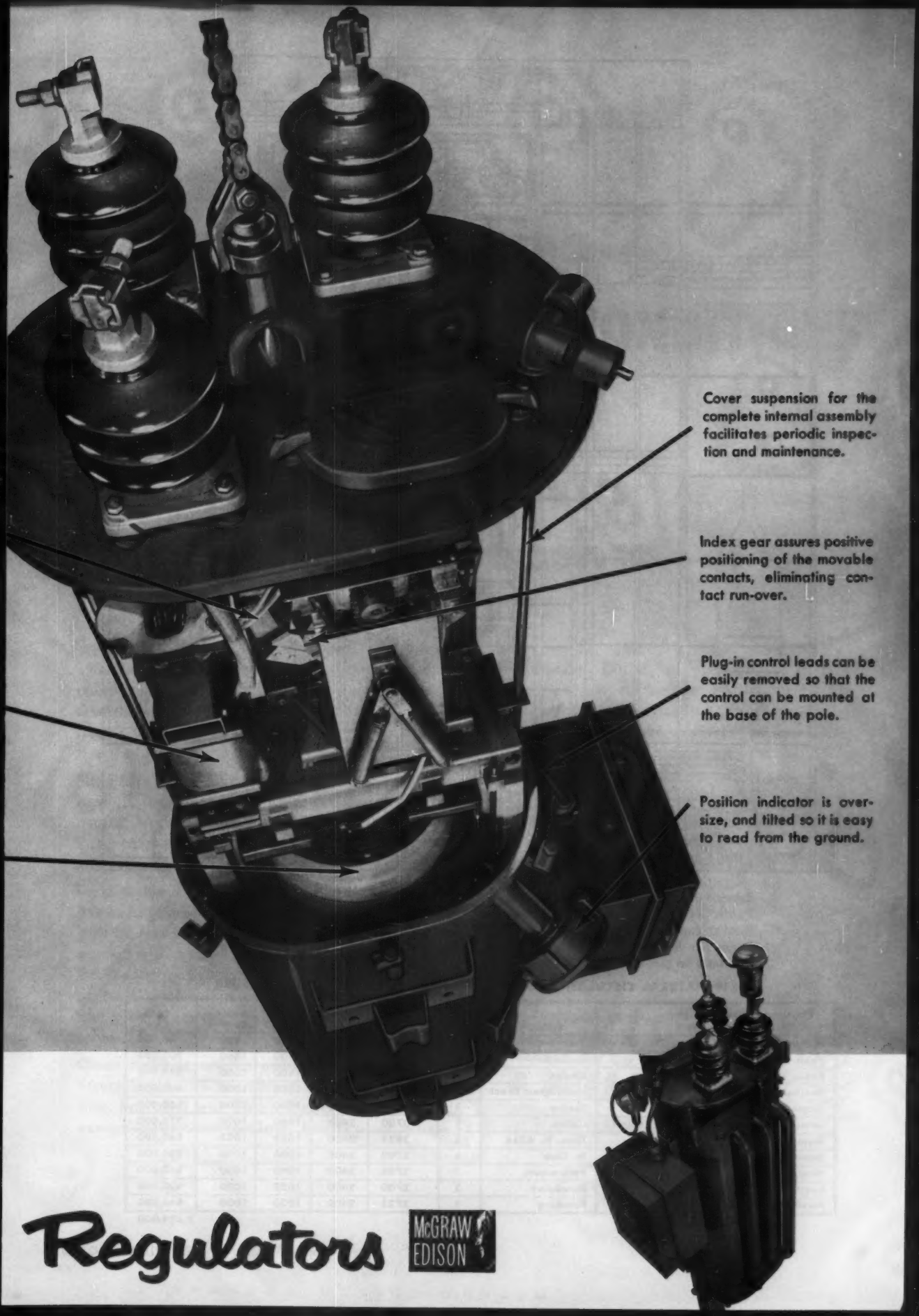
Bridging reactor provides smooth tap changes . . . no current interruption or voltage dip.

L-M's exclusive Round-Wound core-coil assembly provides a balance of low copper loss, low exciting current, and low core loss.

Available Ratings

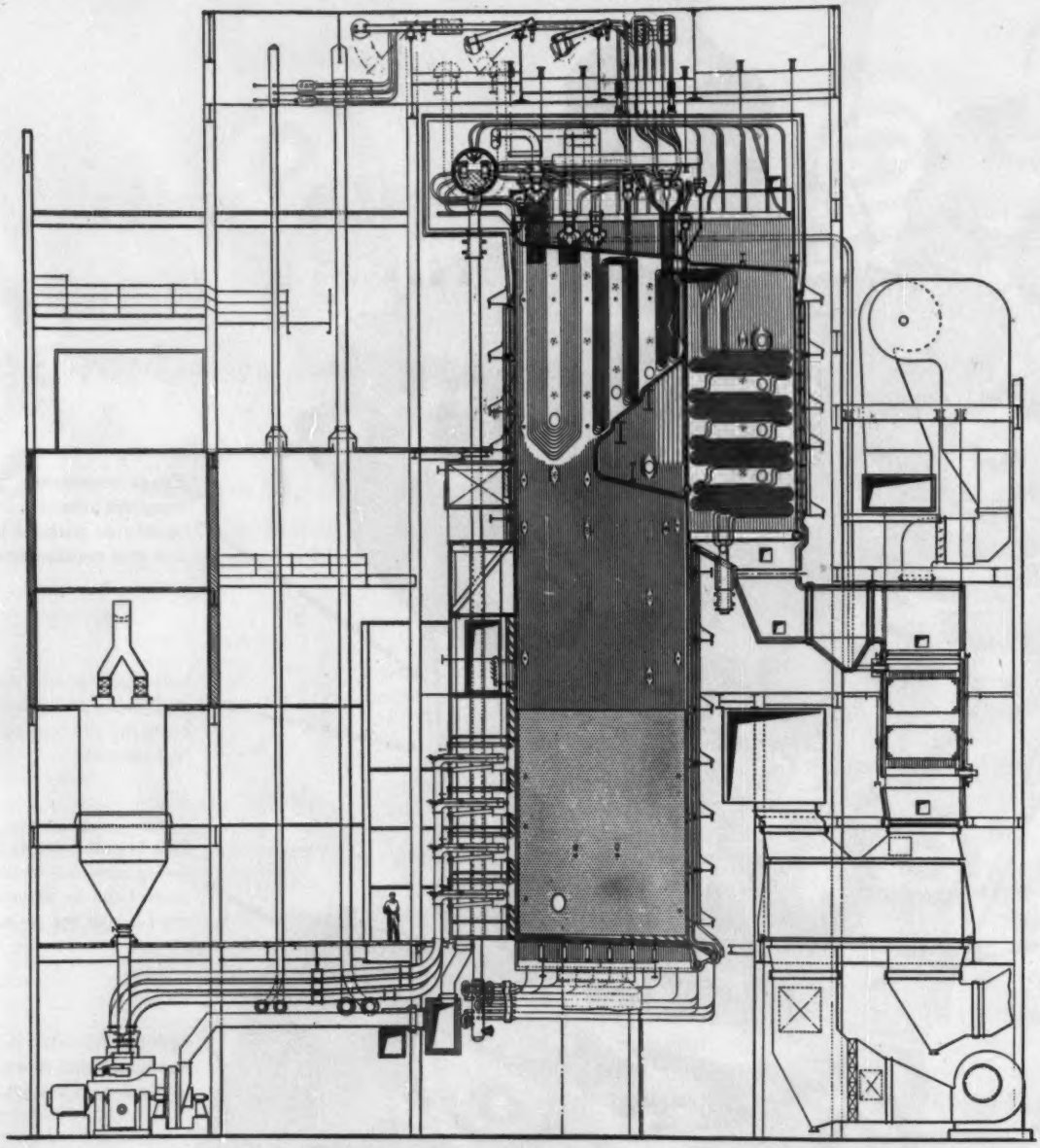
2500 volts . . .
100, 150 and 200 amperes
5000 volts . . .
50, 100, 150 and 200 amperes
7620 volts . . .
25, 50, 75, 100, 150 amperes

LINE MATERIAL Industries
McGRAW-EDISON COMPANY


Cover suspension for the complete internal assembly facilitates periodic inspection and maintenance.
Index gear assures positive positioning of the movable contacts, eliminating contact run-over.
Plug-in control leads can be easily removed so that the control can be mounted at the base of the pole.
Position indicator is oversize, and tilted so it is easy to read from the ground.

Regulators

McGRAW EDISON



Latest unit for Burlington Station, Public Service Electric & Gas Company has a capacity of 1,350,000 lb of steam per hr. Comprehensive circulation tests on this unit, plus more than a year of sustained performance, proved that natural circulation boilers can operate easily with drum design pressures of 2800 psi, for throttle conditions over 2400 psi.

B&W NATURAL CIRCULATION BOILERS ABOVE 2600 PSI DESIGN PRESSURE

NAME OF UTILITY	STATION	NO. UNITS	DES. PRESS. psi	THROTTLE PRESS. psi	TOTAL TEMP. F	REHEAT TEMP. F	TOTAL KW
Indiana & Michigan Electric Co.	Twin Branch	1	2650	2335	940	900	76,500
Public Service Electric & Gas Co.	Burlington	1	2700	2350	1100	1050	200,000
Public Service Electric & Gas Co.	Linden	1	2700	2350	1100	1050	225,000
Southern California Edison Co.	Huntington Beach	2	2700	2400	1050	1000	400,000
Virginia Electric & Power Co.	Bremo	1	2700	2400	1000	1000	150,000
International General Electric Company	Chiba	1	2700	2400	1060	1010	175,000
Memphis Light, Gas & Water Div.	Thos. H. Allen	3	2825	2400	1053	1053	862,500
Detroit Edison Co.	St. Clair	1	2700	2400	1050	1000	325,000
Virginia Electric & Power Co.	Portsmouth	1	2700	2400	1000	1000	150,000
Southern California Edison Co.	Mandalay	2	2700	2400	1050	1000	400,000
Pacific Gas & Electric Co.	Pittsburg	2	2725	2400	1050	1000	660,000
TOTAL CAPACITY SERVED							3,624,000

If You Are Considering...

2400 PSI THROTTLE CONDITIONS

You'll Want to Investigate B&W's Unique Experience

There's a reason why so many progressive utility companies and their engineers, thinking of turbine throttle conditions of 2400 psi, have turned to B&W. It is the unique record of performance of B&W high pressure natural circulation boilers.

Simplicity of installation and operation has been brought to high pressure steam generation by B&W natural circulation boilers. They have lower operating costs because no machinery requiring power and maintenance is needed for circulation.

Long range operating experience—since 1939—has been gained with natural circulation high pressure boilers operating above 2000 psi. Operators' success with natural circulation boilers is due to the B&W Cyclone Steam Separator, and a design which makes liberal use of outside downcomer capacity and provides proper balance of makeup and riser tubes.

Clean turbines are an extra plus value. Cyclone Steam Separators not only maintain good circulation, but, used with Steam Washers, they maintain exceptionally clean turbines. At one plant, where a B&W Radiant Boiler has been on the line constantly for a year, the turbine manufacturer reports that the turbine is the cleanest high pressure unit his engineers have ever seen. And tubes in the high duty part of the furnace are as clean internally as the day they were installed.

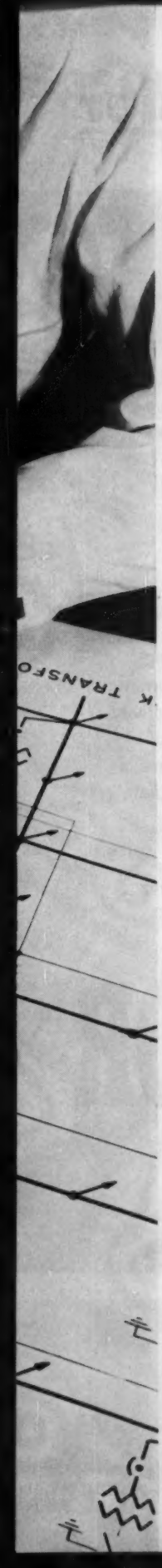
B&W first designed natural circulation boilers for operation at drum pressures over 2000 psi nearly 20 years ago. Today 86 B&W natural circulation boilers with these high design pressures are in operation and 52 more are being built.

The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

G-845-C5

BABCOCK & WILCOX

BOILER DIVISION



WORRIED ABOUT LOAD GROWTH?

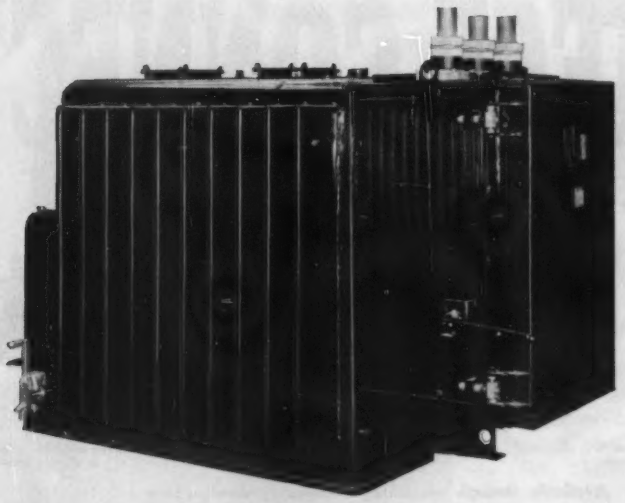
The time is now, isn't it? Time to reconsider your anticipated growth areas?

With experts predicting 300% load increase in the next twelve years, compared to 100% each decade in the past, it's a rare distribution engineer who doesn't find himself confronted with a new rash of problems.

To handle these problem areas, many progressive utilities already have their network systems in operation, or well into the planning stage. Since the first automatic a-c secondary network was installed in New York City in 1922, experience has proved their superior service in high-density, rapid-growth areas. Today, over 280 cities throughout the country already are enjoying the advantages of a-c secondary network distribution.

Check the experience of the networks close to you. Westinghouse engineers stand ready to cooperate with you and your consultants on network studies. Westinghouse equipment can simplify your conversion and expansion problems. J-97200

YOU CAN BE SURE... IF IT'S Westinghouse

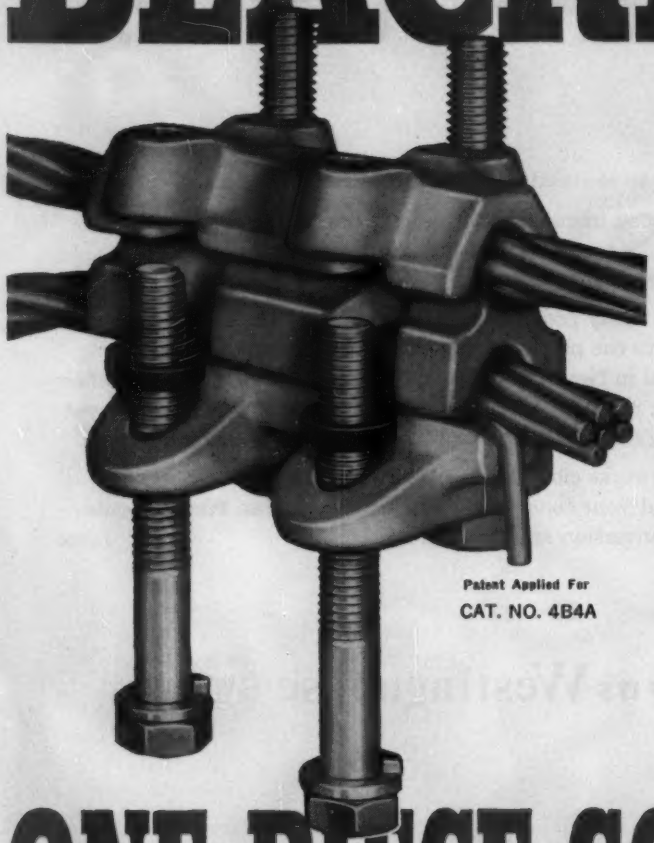


New Westinghouse Space-Miser network transformer, shown with protector mounted to the low-voltage throat. Unit pictured is 750-kva, 15-kv class transformer with 2500-ampere protector.

In addition to standard ratings in all classes, Westinghouse has developed network protectors for heavy, medium and light load density, 120/208-volts and 265/460-volts.

It's New! Installs quicker...easier

BLACKBURN



Patent Applied For
CAT. NO. 4B4A

It's here... a heavy duty one-piece 4-bolt connector with all the electrical and mechanical advantages of a U-bolt connector... yet much easier to install.

No bothersome nuts, washers, housings, spacer to take apart and assemble. Just three quick, easy steps and installation is completed.

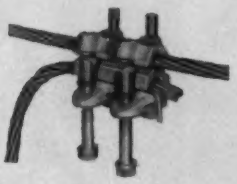
Housings are of non-copper-bearing aluminum alloy. Spacer of soft aluminum pig protects conductor, aids conductivity. Spacer treated with heavy coating of oxide inhibiting compound. Hardware is high strength aluminum alloy completely alumilited to prevent seizing.

WIDE RANGE...
Accommodates conductors—2/0 to 397.5 ACSR—3/0 to 477 MCM.

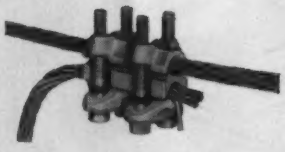
ONE-PIECE CONNECTOR

HERE'S HOW EASY THE NEW 4-BOLT CONNECTOR IS TO INSTALL

Unscrew the two free bolts contained with neoprene washers and hang over main.



Insert tap wire.

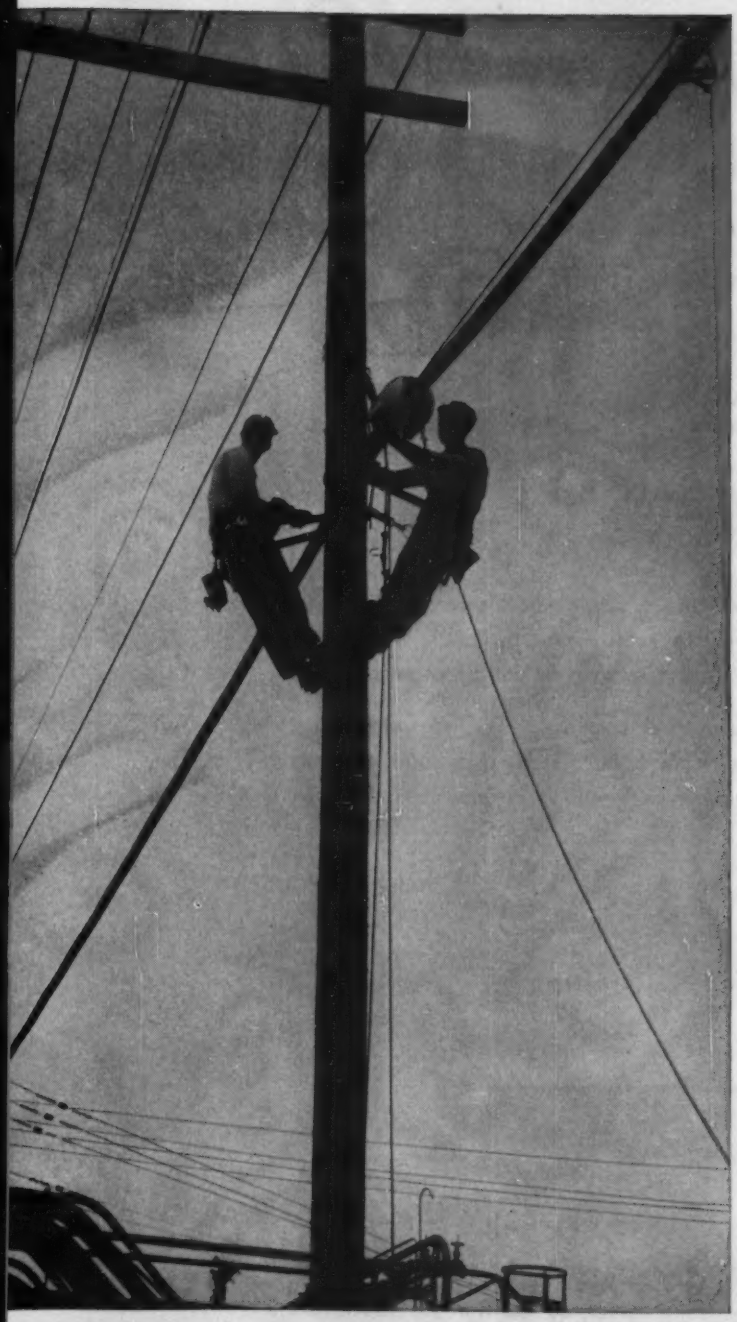


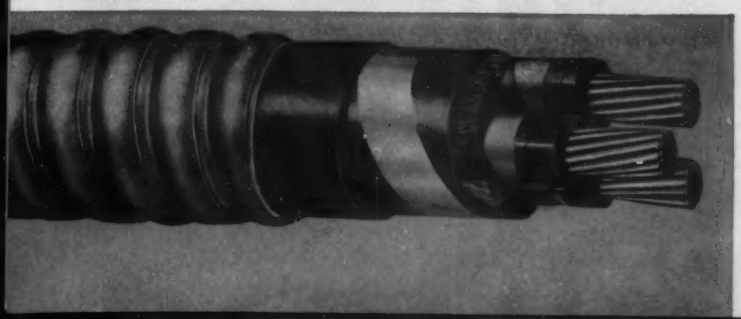
Tighten and you have the ultimate in a good connection.

Available through electrical wholesalers everywhere

JASPER BLACKBURN CORPORATION
ST. LOUIS, MISSOURI

Speed new power on old poles—cut costs
with Anaconda Duralox Interlocked-armor Cable





METAL TAPE ARMOR AFFORDS HIGH PROTECTION AGAINST DAMAGE—NO CONDUIT NEEDED.

When a large Gulf Coast refinery needed additional power, the job was done *quickly* and *economically* because Duralox* could be strung on existing power-line poles—below the old lines. Neither new poles nor cross-arms were needed.

Installation time and costs are slashed with Duralox. Outdoors or in, it is readily trained around or over machinery, beams, piping and other obstructions in long, unbroken runs.

Duralox increases plant flexibility, affords easy maintenance and minimizes down time because it is generally accessible, easily relocated—100% salvageable. *Reg. U.S. Pat. Off. 21407

NEW BULLETIN DM 5606 contains full information about Anaconda Duralox Cable. Write for your free copy today. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

Ask the Man from

ANACONDA®
for DURALOX CABLE

EXISTING POLES are utilized at well-known refinery for additional power. Cable is Anaconda's 4/0 Awg Duralox Interlocked-armor Cable.

DURALOX CABLE is available in sizes No. 6 Awg to 750 Mcm—copper or aluminum conductors with rubber, plastic, or varnished-cloth insulation—up to 15kv. Underwriters' approved for 600 volts and 5000 volts, varnished-cloth insulation, galvanized steel armor!

"You know Ormonde:

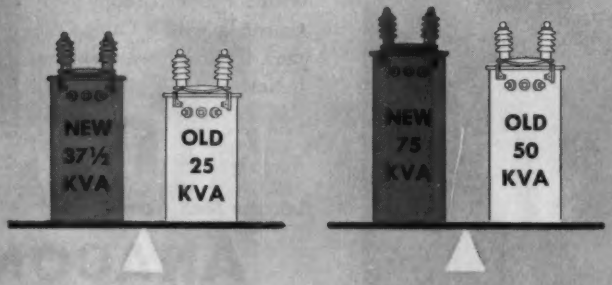
KUHLMAN HAS REDUCED WEIGHT UP TO 40%

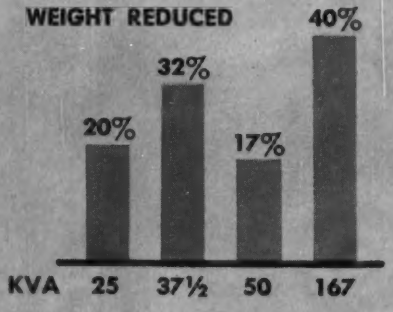
Take these popular distribution transformer KVA sizes for example:"

Do you know this Kuhlman Salesman? *

During the last few years Kuhlman distribution transformers have been made lighter, smaller and shorter. They are easier to handle, require less storage space, and in the higher KVA ratings save the cost of larger poles.

This modern trend to lighter, more compact design was originally started by the Kuhlman Bent Iron Core more than 20 years ago. Today refinement of the "Bent Iron" principal has made even greater improvements possible. For example:

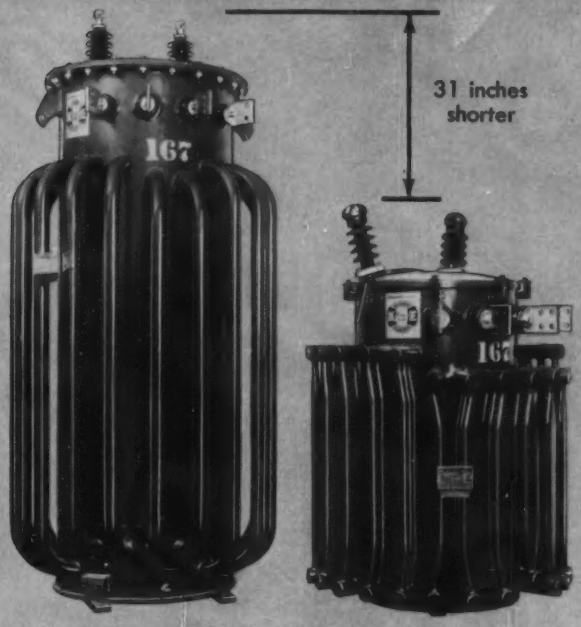




The 75 KVA transformer now requires the same pole as the old 50 KVA—the 100 KVA weighs approximately the same as the old 75 KVA. In fact, all popular ratings are substantially lighter, as shown in the above chart.

* KUHLMAN "Salesman of the Week"

If you can identify this Kuhlman Electric Co. representative, and are the first one to notify Dept. SA-1, Kuhlman Electric Co., Bay City, Michigan, you will receive a valuable gift certificate. Each week a different Kuhlman representative is featured . . watch for the Kuhlman salesman who calls on you.



OLD 167 KVA NEW 167 KVA

SPECIAL FEATURES:

- ★ **Flat cooling tubes to reduce width.**
- ★ **Height reduced 31 inches—now the same as a 37½ KVA unit.**
- ★ **Designed for direct pole mounting.**
- ★ **Designed to replace a 75 or 100 KVA unit.**

Height has, also, been reduced. The most outstanding example is the 167 KVA which is 31 inches shorter and weighs around 1600 pounds. This unit can now be pole mounted in place of a 75 or 100 KVA unit to give additional capacity without the extra cost of installing heavier poles or platforms.

The 167 is only one of the many ways Kuhlman is meeting the need for shorter, lighter transformers. Ask for our price list PL-200A and check the latest in Kuhlman weights and dimensions.

"Not only weight, Bill, but:

HEIGHT HAS BEEN CUT 38%, TOO

Look at the big reduction on the 167 KVA:"

Who is this Kuhlman Salesman? *

579a

KUHLMAN ELECTRIC COMPANY

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

An ounce of scientific prevention

Like the dramatic progress in medical science, modern tree care bears little resemblance to the crude methods of only fifty years ago. No longer is it enough to repair damage—to cut away a limb that has died. Today, as always, we seek the answer "Why"—the cause of the damage or disease and apply every modern technique and curative treatment. Only in this way can America's rich heritage of shade trees be preserved.

Scientific tree care is available to you through your local Bartlett representative, a highly skilled technician backed by the knowledge and experience of the Bartlett Tree Research Laboratories. If you have trees which you value, it will pay you to consult him before you need him. No one knows better than a Bartlett client, that an ounce of scientific prevention is worth many many pounds of cure.

REMEMBER

Our long experience in working with both utilities and the public is your assurance of dependable work and good customer relations.

1907–1957
50 years Progress in Scientific Tree Care

BARTLETT TREE EXPERTS

Home Office, Research Laboratories and Experimental Grounds, Bartlett School of Tree Surgery, Stamford, Conn. Local Offices from Maine to the Carolinas, and West to Indiana. See your Local Telephone Directory for Local Address.

ANDERSON ELECTRIC

Anderson's Pistol Grip aluminum dead end clamps give top performance on distribution and sub-transmission systems. Snub Seat design assures high holding power. Strong, lightweight aluminum construction reduces cable damage, and one-piece keeper assembly speeds installation.

ANDERSON ELECTRIC CORPORATION
Birmingham 1, Alabama.

Export Representative: International Standard Electric Corp.

Aluminum & Bronze Power Connectors • Clamps • Fittings • Accessories for SUBSTATION • TRANSMISSION • DISTRIBUTION

How to weld copper bus bars by the inert-gas arc process

Although bolted connections are the general rule in bus bar installations, there are many instances where permanent connections are desirable and economical in fabrication of components.

Welded joints can be used to effect savings in joint materials and bus bar (no overlapping is necessary as in brazed joints), at the same time adding but little to dimensions of conductors at the joint.

High-conductivity weld metal does not give the best joint. Any electrical advantage it might have is offset by the reduction of effective cross section due to weld-metal porosity.

But excellent results have been obtained in large copper bus installations where welds have been made with Anaconda Copper-372 Welding Rod and the inert-gas arc processes. Joints made in this way are sound and free from porosity. The volume of weld metal in the joint is a very small percentage of the conductor and has very little effect on the over-all resistance.

RESISTANCE MEASUREMENTS on ½"-wide sections cut from a ¼"-thick conductor welded with Anaconda Copper-372 Welding Rod by the inert-gas tungsten-arc process illustrate the point:

Test Length	Across the weld	Unwelded bar
1 meter	0.0002145 ohms	0.0002136 ohms
2 inches	0.00001319 ohms	0.00001085 ohms

It is obvious that when measured over lengths of several feet the increase in resistance caused by the weld is negligible. Furthermore, the high heat-conductivity of the adjacent base metal eliminates any tendency to produce hot spots.

WELDING METHODS. The inert-gas arc processes are preferred for welding copper conductors. Helium develops higher heat levels than argon and improves the flowing properties of the weld metal. It is the preferred shielding gas for tungsten-arc welding. Argon is the usual shield in the consumable-electrode process. When thicknesses exceed ⅛", the joint ends should be bevelled, and single-vee grooves with 90-degree included angle are the rule.

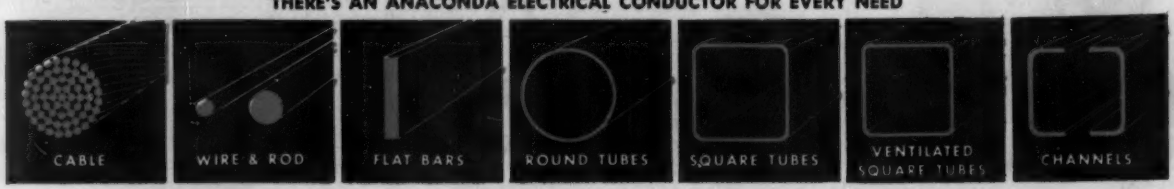
FOR MORE INFORMATION and details of procedures for various thicknesses, write for Anaconda Publication B-13. For general information on the properties of copper conductors—plus convenient new tables giving physical and electrical data on all types of Anaconda rigid bus conductors—send for 62-page Publication C-25. Address: The American Brass Company, Waterbury 20, Conn. 87103

ANACONDA®

COPPER CONDUCTORS

Made by The American Brass Company

THERE'S AN ANACONDA ELECTRICAL CONDUCTOR FOR EVERY NEED



Mushrooming Suburbia

Once-rural lines become heavy load

How often have your engineers and line crews faced a situation like this?

Acme Land Company buys the old farm out the north road from town, subdivides it and promotes "Luxurious Electrical Living in Oak Hill Acres".

That puts the load on you . . . immediately . . . and the old north road feeder has to be stepped up, fast.

The things that happen next can be good, depending on how you look at it. The promotion catches on. Next comes the shopping center. More developers cluster around and a quiet rural line has suddenly mushroomed into a booming suburb.

That's when you appreciate the extra values engineered into Westinghouse equipment . . . basically sound electrical designs with thoughtful provision for fast, safe and easy installation.

The following pages point out the extra values.

YOU CAN BE **SURE**... IF IT'S Westinghouse

POLE-TOP SAVINGS IN SUBURBIA . . .

The Westinghouse transformers you hang today give 20% extra margin for load expansion

Brighter prospects are in store for electrical living. To help carry the new and anticipated loads, overload capacity of all Westinghouse CSP® and Type S transformers has been increased 20%. This added capability is a solution to the problems in sudden growth areas. Now you have more time for load checks, better service planning. It means fewer trip-outs, fewer emergency service calls, greater flexibility for timing change-outs. Breaker emergency settings on CSP transformers are up an additional 15%, insuring service during emergency overloads.

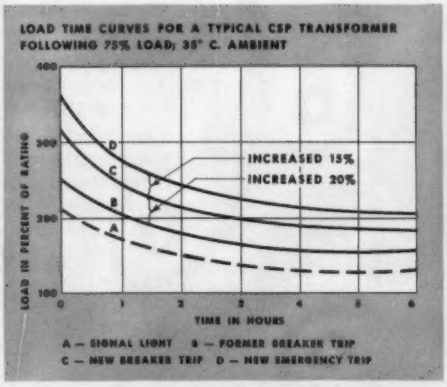
An optional thermal-duty indicator on Type S transformers provides easy, practical load monitoring—a red signal light, set at ASA level, shows overloading; a dial records cumulative overload hours. Extremes of burnouts in some locations, wasted capacity in others, can be avoided.

Proved by Functional Life-Testing . . . greater, longer overloads *without sacrifice of normal service life.* Westinghouse life-tests *complete units* under simulated service conditions, with aging accelerated ten times—thirty years' normal life compressed into three.

Three years' laboratory life-testing, backed by four and one-half years' field operation at three major utilities . . . without a single failure! This field experience of 10,412 Westinghouse transformers proves their thermal endurance . . . proves they can handle the electrical growth of mushrooming Suburbia, economically and faithfully.

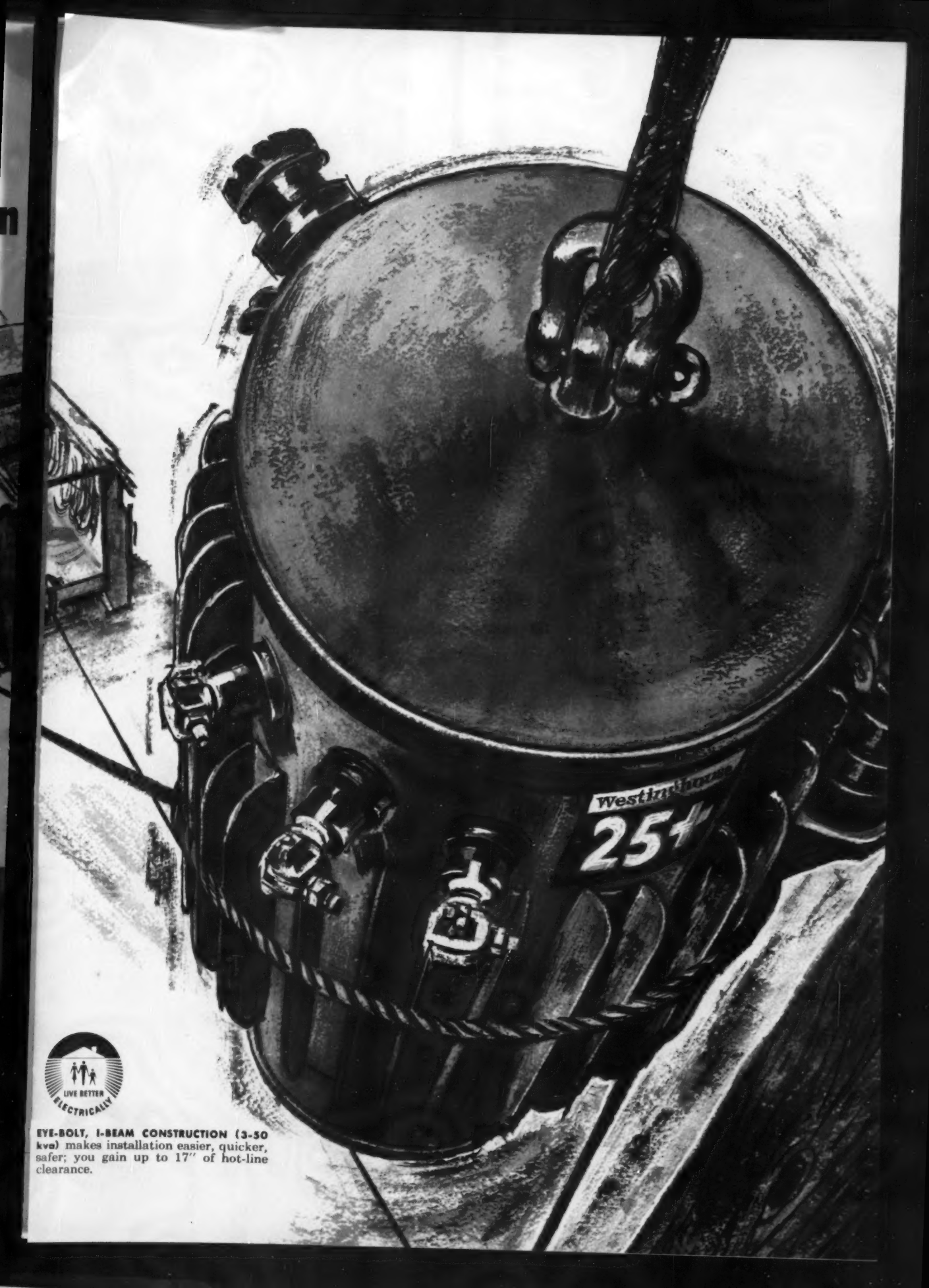
YOU CAN BE SURE...IF IT'S Westinghouse

REDUCED HEIGHT SAVES POLE SPACE (25-167 kva) allows replacement with next larger rating without change in secondaries.

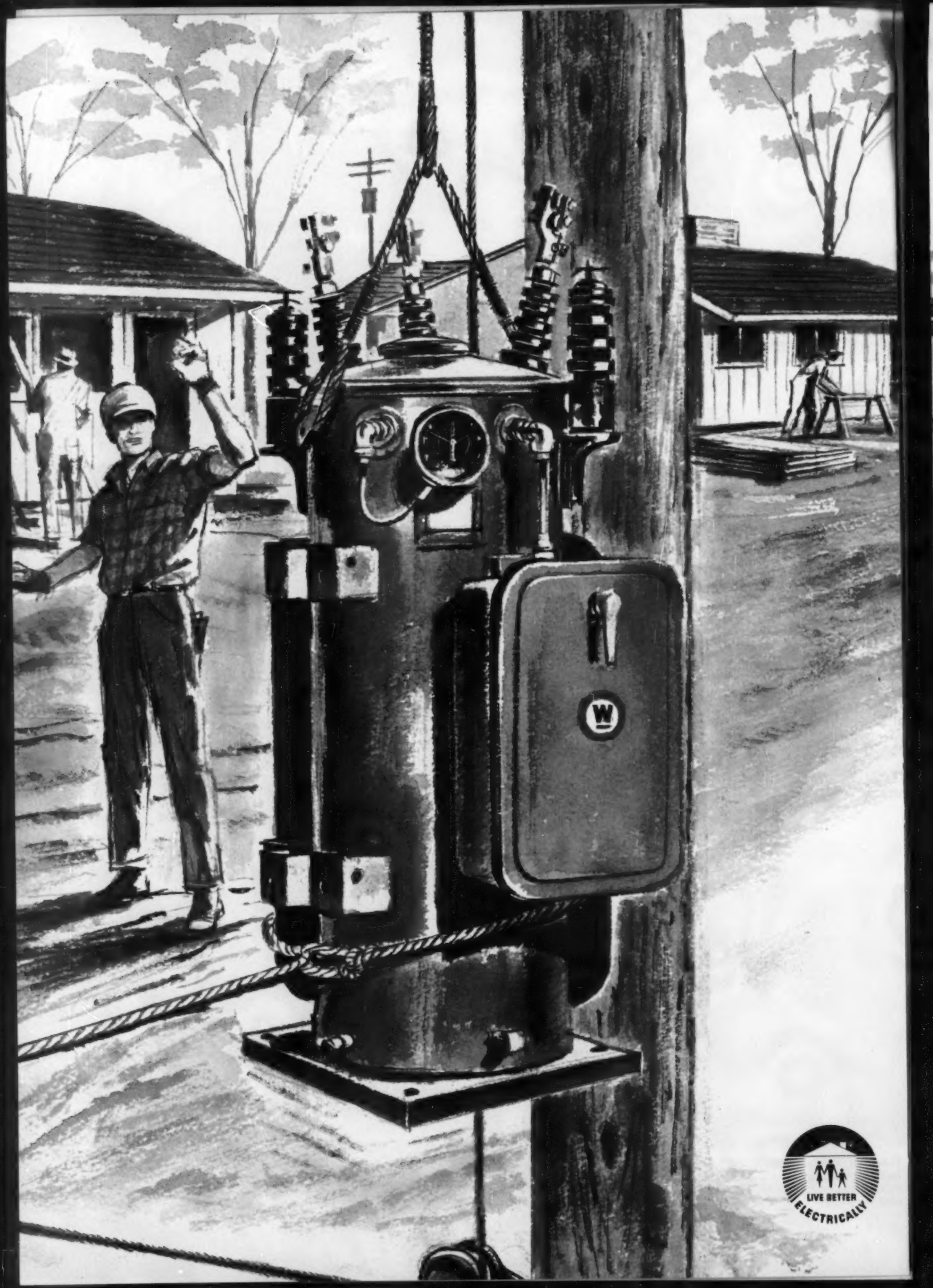


HIGHER BREAKER SETTINGS provide 20% greater overload capacity for the new Westinghouse CSP transformer, 15% more emergency range.

CUMULATIVE OVERLOAD RECORD Thermal-duty indicator measures overloading accurately, on basis of copper temperature. Optional with Type S units.



EYE-BOLT, I-BEAM CONSTRUCTION (3-50 kva) makes installation easier, quicker, safer; you gain up to 17" of hot-line clearance.


LIVE BETTER
ELECTRICALLY

FOR LOAD GROWTH IN SUBURBIA . . .

Westinghouse URL and URF step regulators maximize customer service

For Suburbia's new areas of electrical living, the Westinghouse system of voltage regulation, a unique combination of work-together voltage regulation principles, pays off with:

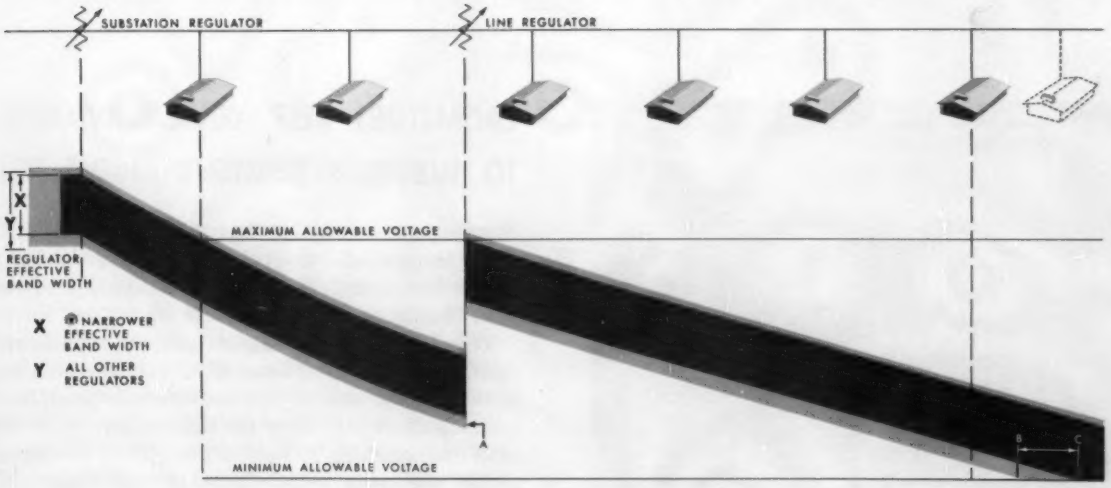
1. Narrowest effective bandwidth.
2. Heavier allowable loading of existing lines, with satisfactory voltages farther out on the line.
3. Protection against sudden high voltages which can damage user equipment.
4. Minimum equipment investment—deferred expansion to meet growing loads.

Features of the new Westinghouse URL and URF step regulators that provide this room-to-grow regulation are:

1. Exclusive—new CVR voltage-regulating relay with integral, adjustable, inverse time delay—reads voltage, evaluates need for correction, eliminates unnecessary tap changes.
2. Exclusive—instant response tap changer mechanism—operates 15 times faster than other types of mechanisms after relay signal.
3. Exclusive—1¼% step regulation covers a total range of 20% in 16 steps—maintains most effective voltage level.
4. Load range selection enabling you to select a range of regulation which matches the load current requirement.

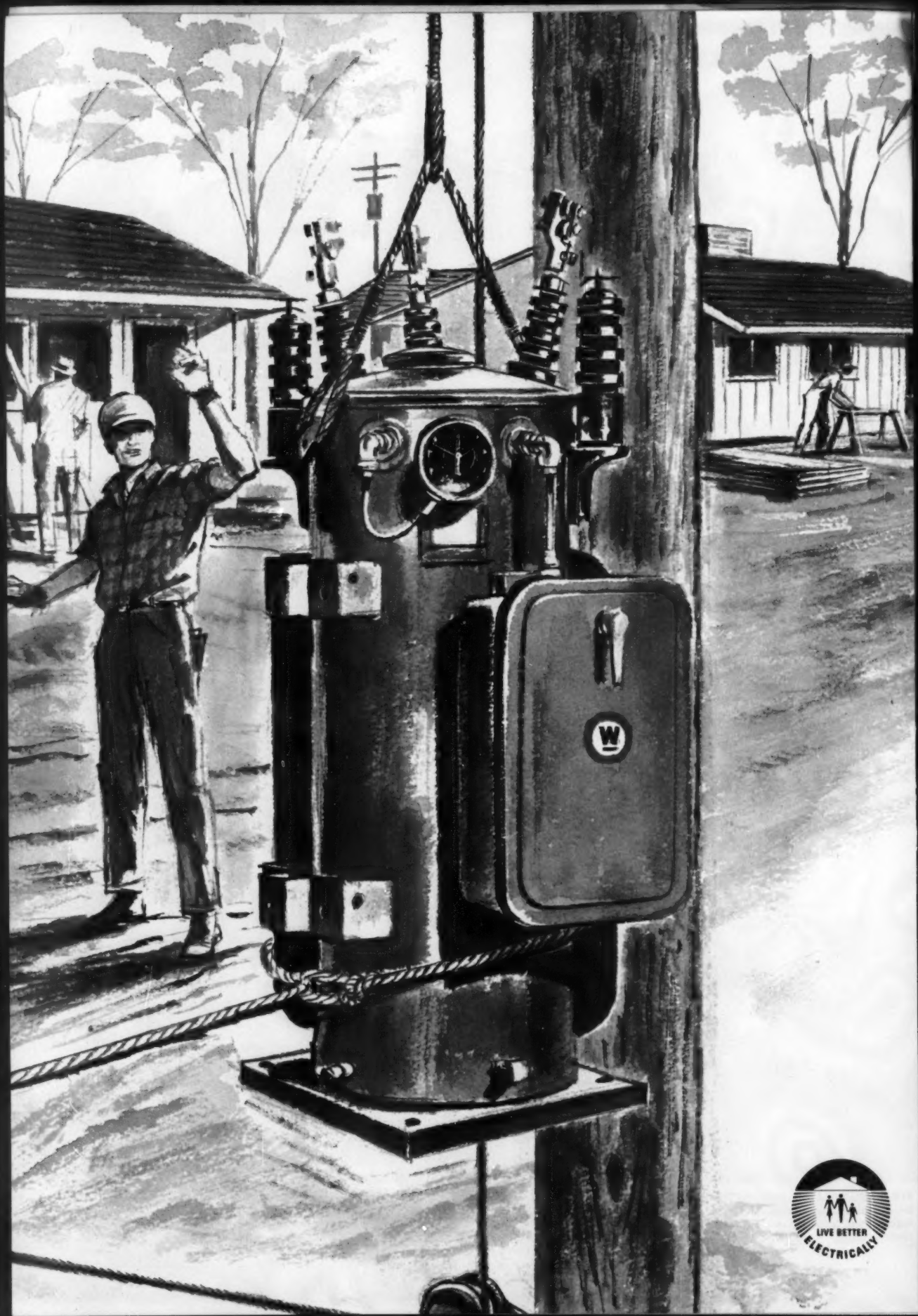
Westinghouse—first with the future—provides tomorrow's regulators today, offering the highest quality of service demanded by today's electrical living—combined with rock-bottom operating expenses.

YOU CAN BE SURE...IF IT'S Westinghouse



Here's how your new or extended distribution lines can benefit from Westinghouse URL or URF voltage regulators, using 1¼% voltage regulation. At point "A" above, other regulators use more of allowable voltage drop. Exposed gray bandwidth shows extra line drop available for load growth when using Westinghouse regulators. Similarly, distance "B-C" represents additional margin for growth or line extension.

The reason? With 1½-volt steps, Westinghouse regulators maintain voltage closer to balance voltage. In addition, 16-step regulation means 42% fewer operations, 15% less contact erosion, reduced maintenance, longer life.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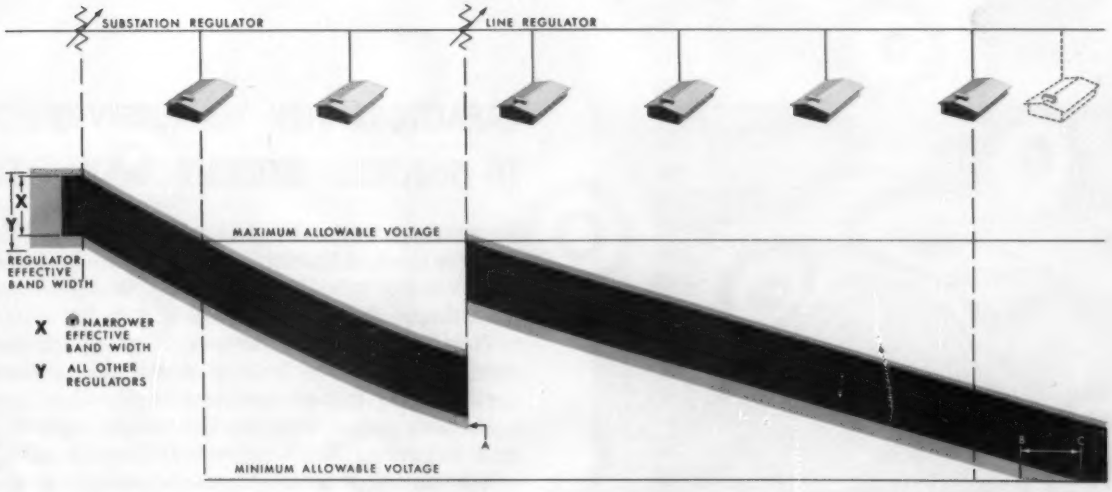
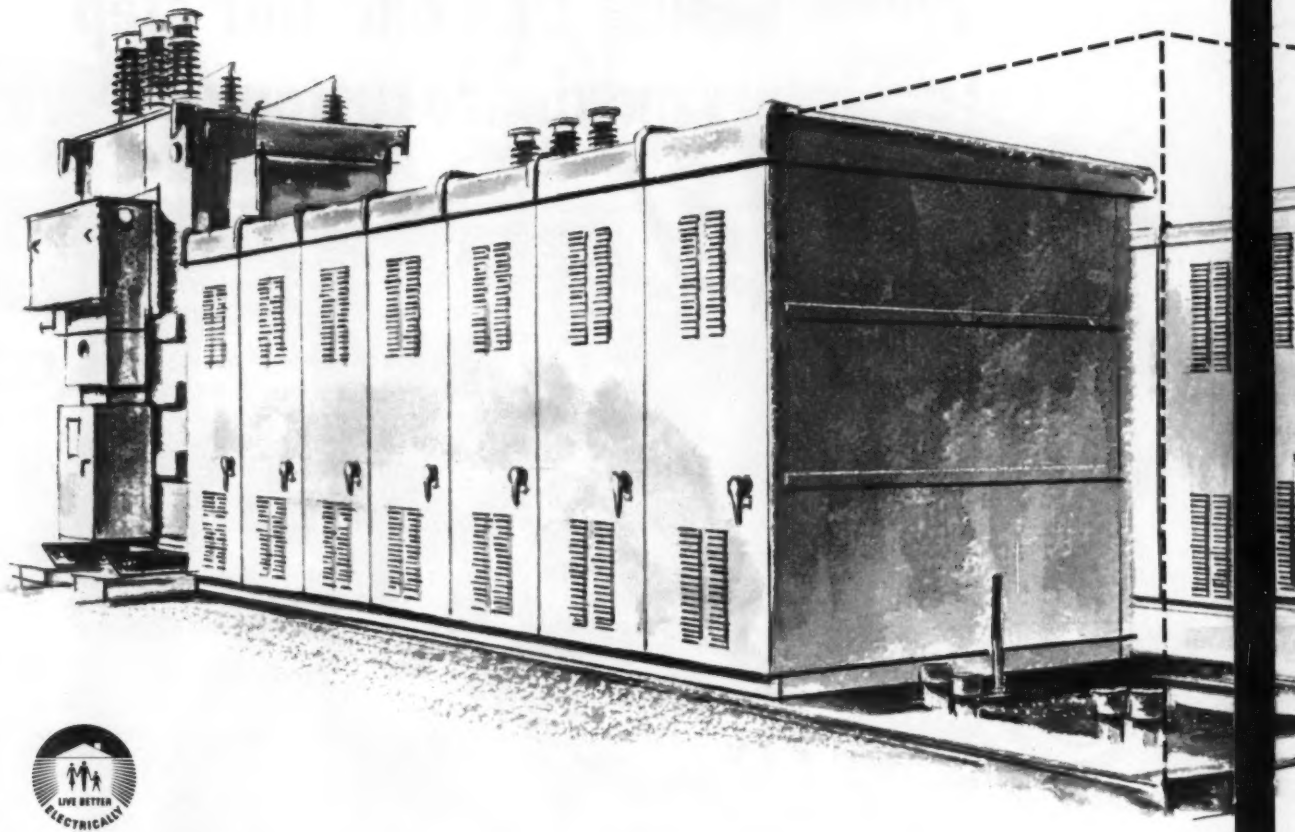
YOU CAN BE SURE... IF IT'S Westinghouse

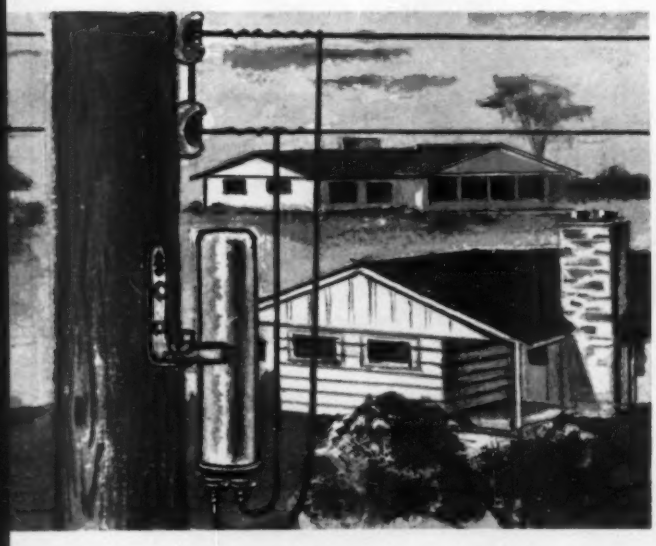


Here's how your new or extended distribution lines can benefit from Westinghouse URL or URF voltage regulators, using 1¼% voltage regulation. At point "A" above, other regulators use more of allowable voltage drop. Exposed gray bandwidth shows extra line drop available for load growth when using Westinghouse regulators. Similarly, distance "B-C" represents additional margin for growth or line extension.

The reason? With 1½-volt steps, Westinghouse regulators maintain voltage closer to balance voltage. In addition, 16-step regulation means 42% fewer operations, 15% less contact erosion, reduced maintenance, longer life.

These unit substations are



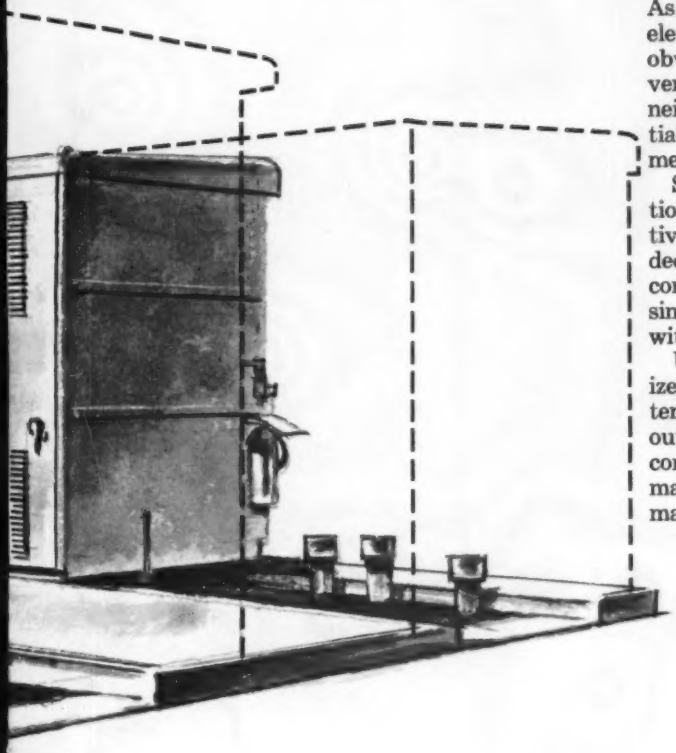


CAPACITORS KEEP YOUR SERVICE TO SUBURBIA EFFICIENT

Keeping up with the Joneses is the well-known favorite sport of Suburbia's population—and that's good—but it calls for sufficient capacity to serve their electrical way of life most efficiently.

Westinghouse Inerteen® secondary capacitors, at ratings of 3, 5, 7½ kvar give you the maximum useful power out of the transformer and to the customer's meter. They are lightweight, easy to install and versatile in application. They mount with either crossarm or pole bracket—terminals up or down. Used terminal leads are already attached. Extruded aluminum case eliminates corrosion and maintenance problems.

designed to grow with suburban development



As Suburbia lives better electrically, it is growing in electrical load—even where physical expansion isn't obvious. Westinghouse anticipated this almost universal distribution problem—designed these "good neighbor" unit substations for great growth potential—but with minimum immediate capital investment.

Standardized metal-clad switchgear makes addition of feeder units economical and visually attractive. Transformers can be soundproofed to lower decibel ratings for less cost—and box-type throat connections make transformer interchangeability simple. Single-end stations can become double-end with minimum installation time and man power.

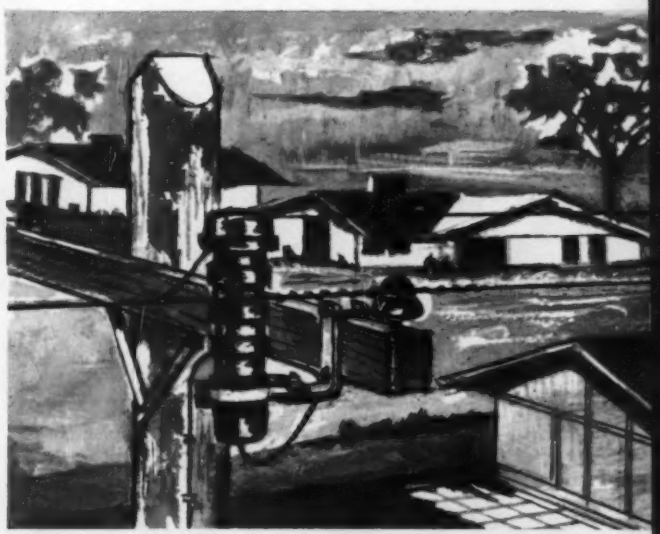
Undercoating and multicoat painting of bonderized, heavy-gauge sheet metal further reduce maintenance, extend life and expansion potential of outdoor metal-clad switchgear. In addition, *all* components are engineered and coordinated by one manufacturer—assuring complete control of design, manufacture and assembly.

YOU CAN BE **SURE**... IF IT'S

Westinghouse

MODERN SUBURBIA NEEDS MODERN ARRESTERS

As Suburbia spreads out, and lines become longer, chances of outages caused by lightning are increased. Westinghouse LV distribution arresters up the odds in your favor against this loss of revenue. The combination of a pre-ionized gap and Autovalve® blocks insures fast action and high surge capacity. The Westinghouse drop-out feature eliminates all possibility of line lockout and gives indication of a damaged arrester. Finally, the moisture-proof seal—pressure tested with dry nitrogen—is proof against radio-TV interference. The field-tested, time-proved LV is typical of the complete line of quality, hard-working Westinghouse arresters.



30-ampere meters measure maximum "Housepower" loads

The longest mortgage in Suburbia will be burned years before the first Westinghouse 30-ampere watthour meter has to be changed.

This Lifetime meter is guaranteed for thirty years. It has its own expulsion-type lightning arrester—discharges the arc outside. It is frictionproofed by sapphire bearings. It has 200-ampere extended range capacity—enough to measure accurately all the load that can be applied to single-phase service.

What's more, it doesn't cost a penny more than conventional 15-ampere rated meters.

This 30-ampere Lifetime meter is another example of designed-in and built-in growth potential available in Westinghouse distribution equipment. Your Westinghouse sales representative can be a real partner in your buying for today—with an advantage for tomorrow. CP1042

YOU CAN BE SURE...IF IT'S

Westinghouse

NUCLEAR NEWS FROM ATOMICS INTERNATIONAL

AI develops reactors for largest power plants and smallest research labs

A wide selection of nuclear reactors, ranging in size from a 75-megawatt nuclear power plant to generate electricity, to a 5-watt laboratory instrument, have already been completed, or are at present under construction by ATOMICS INTERNATIONAL.

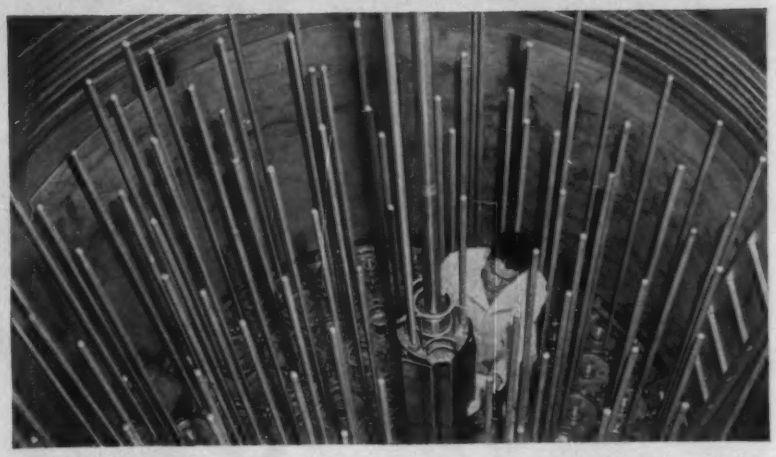
The Sodium Reactor Experiment, part of the Atomic Energy Commission's program to develop economical nuclear power, now undergoing tests in the Santa Susana Mountains near Los Angeles, will have an output of 20 thermal mw and will generate about 6.5 mw of electric power. It is the prototype of a full-scale sodium graphite reactor design, which will have a power output of 75 to 125 mw. ATOMICS INTERNATIONAL regards it as a promising reactor type for economical power generation.

The Organic Moderated Reactor, a relatively new approach to economical nuclear power, is particularly appropriate for smaller plants. ATOMICS INTERNATIONAL is completing construction of the Organic Moderated Reactor Experiment for the Atomic Energy Commission at the National Reactor Testing Station in Idaho, part of a development program for the OMR. Basic advantages of the OMR include compact core with good neutron economy, low pressure coolant system, and freedom from corrosion problems. The OMR is also considered promising for ship propulsion, and ATOMICS INTERNATIONAL is making a design study of this reactor type for maritime use.

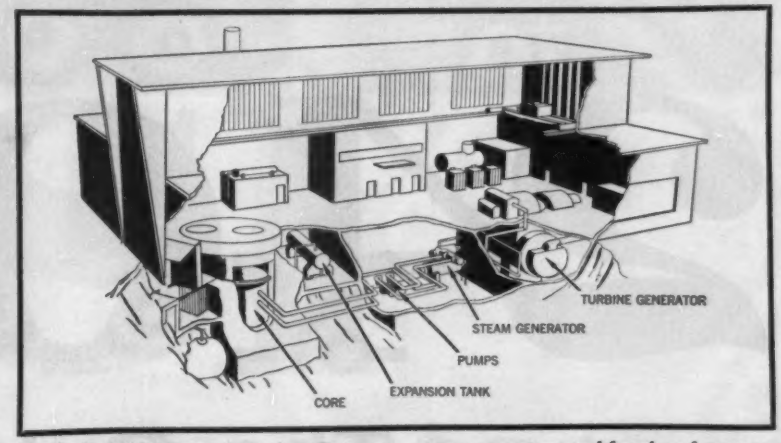
Research Reactors are now being built by ATOMICS INTERNATIONAL for Japan, Denmark, West Germany, and West Berlin. They are similar to the ATOMICS INTERNATIONAL reactor now in service at Armour Research Foundation, Chicago—the first to be designed specifically for private industrial research.

The Laboratory Reactor is a new, low-cost instrument designed specifically to meet the needs of universities and industrial laboratories for nuclear training and research.

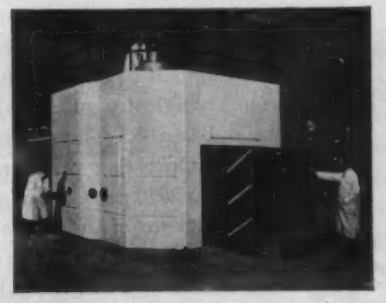
ATOMICS INTERNATIONAL, one of America's major builders of nuclear reactors, is staffed and equipped to help you with any phase of reactor development. Please write: Director of Technical Sales, Dept. EW-73, ATOMICS INTERNATIONAL, P. O. Box 309, Canoga Park, Calif. Cable address: ATOMICS.



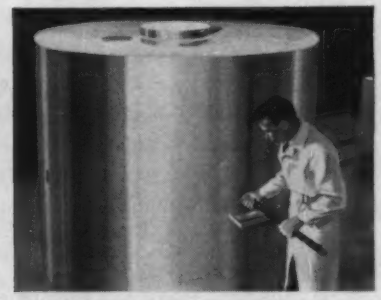
Reactor "heart". An AI technician installs zirconium "cans" containing the graphite moderator in the core of the Sodium Reactor Experiment. The use of a sodium coolant allows a high-temperature, low-pressure heat extraction system with high thermal efficiency of power conversion.



Typical OMR Central Station Power Plant. Basic advantages of OMR include small size, compact core, low-pressure system, and freedom from corrosion problems. This also makes it a promising reactor for ship propulsion.

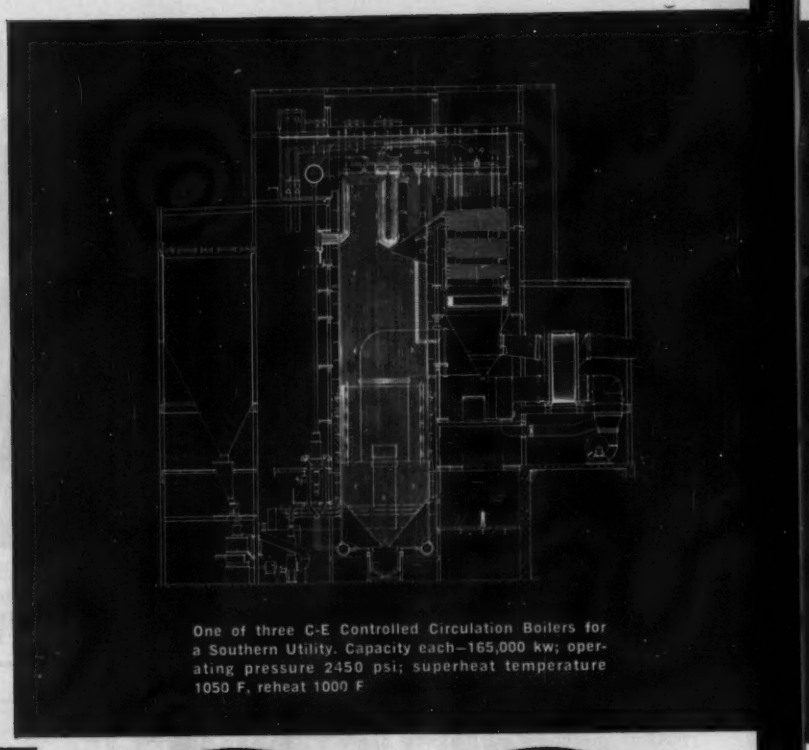


Armour Reactor is a 50 kw water-boiler unit for industrial research. It has nine beam tubes for experimental purposes.



Nuclear Nutshell. Laboratory Reactor operates at 5 watts of power and produces more than 100 isotopes. It can be operated by one trained man.

ATOMICS INTERNATIONAL
A DIVISION OF NORTH AMERICAN AVIATION, INC.
PIONEERS IN THE CREATIVE USE OF THE ATOM



One of three C-E Controlled Circulation Boilers for a Southern Utility. Capacity each—165,000 kw; operating pressure 2450 psi; superheat temperature 1050 F, reheat 1000 F

2400

The Outstanding

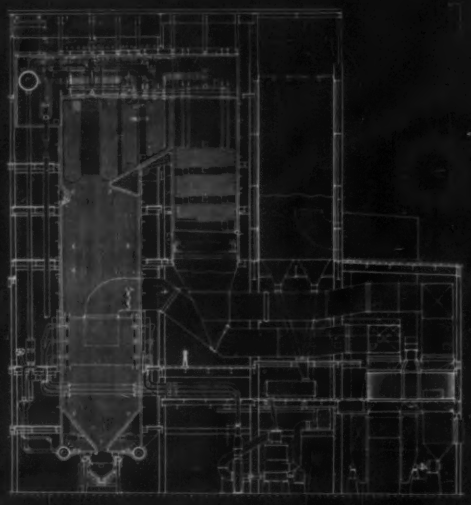
In 1956, the most notable trend in power plant practice was the large-scale adoption of the 2400 lb pressure cycle. In this pressure range, the utility industry purchased more than twice as many C-E units as they did in 1955. These units range in size between 125 mw and 325 mw. Operating pressures ***at the turbine throttle*** range from 2400 psi to 2620 psi. Of course, all are Controlled Circulation Boilers and 3 units are of the C-E Sulzer "once through" design. All units are equipped with C-E Tilting Tangential Burners and, in the larger sizes, a number are of the C-E Twin Furnace design.

COMBUSTION

Combustion Engineering Building

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS;

One of two C-E Controlled Circulation Boilers for a Mid-Western Utility. Capacity each — 200,000 kw; operating pressure—2500 psi; superheat temperature 1050 F, reheat 1050 F



One of two C-E Controlled Circulation Boilers for an Eastern Utility. Capacity each—200,000 kw; operating pressure—2460 psi; superheat temperature 1050 F, reheat 1000 F

PSI

Power Trend of 1956

Orders placed for C-E Boilers in this pressure range, including three purchased prior to 1955, now total 32 units with an aggregate capacity of over 5,500,000 kilowatts. This remarkable record is attributable to the proven suitability of the C-E Controlled Circulation Boiler for the highest range of sub-critical pressure and to its outstanding performance, especially with respect to availability.

The capacity of all C-E Controlled Circulation Boilers ordered since 1950—covering a range of turbine throttle pressures from 1500 to 2620 psi—now totals well over 16-million kw of which approximately 5½-million kw is in service. The cumulative service of these installations is equivalent to more than 60 boiler years.

As this record demonstrates, Combustion designs have anticipated advancement in power practice and have made a significant contribution to the all-important industry objective of achieving ever lower generating costs.

ENGINEERING

200 Madison Avenue, New York 16, N. Y.

PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

To help you with the problem of

A. R. Lee, General Electric application engineer, discusses the many conditions affecting the selection of station control cables—and the wide variety of cable types available to handle the job. Recent General Electric cable developments, and men like Lee who work closely with electric utility engineers, are helping to simplify the complex problem of selecting the right control cables for these many conditions.

control cable selection

General Electric introduces a new cable

A number of application problems often face the electric utility engineer who must select the best control cable for a particular installation. Must he consider the electrostatic effects of adjacent power cables? Is it necessary for the cable to be flame-resistant? Will there be a problem of moisture, of high ambients, or of extreme cold?

In any event, there will be a combination of conditions which should be considered in the selection of the cable most suitable for the application.

Polyethylene Flamenol* Control Cable
A new answer for most applications

Out of General Electric's experience in manufacturing *and using* control cables has come the development of another new type of control cable...a cable that will simplify many application problems. It is the new G-E polyethylene Flamenol* control cable. This cable can be used indoors or outdoors, in wet or dry locations, for aerial or direct burial installations. It combines the best properties of both polyethylene and polyvinyl chloride: the polyethylene insulation provides high dielectric strength, low moisture absorption, and low specific inductive capacity; the polyvinyl chloride jackets, both on the single conductors and over core, resist flame, moisture, oil, acid, alkali, sunlight, weather, and abrasion. The cable is rated 75 C copper temperature, 600 volts.

Extreme conditions may call for other cables

There is always the possibility of the extreme and unusual situation. In these cases the full line of General Electric control cables—and the G-E engineers who know them best—can be of particular help to you. These men, through their broad experience in working with electric utility engineers, have become familiar with (and have helped with the solution of) most of the application problems you will face.

For example, if your problem is moisture plus very high ambients, their answer will probably be a silicone-rubber insulated cable with asbestos braid. If you must have flexibility under conditions of extreme cold, Super Coronol* Geoprene* cable provides it. Even if you require resistance to atomic radiations, G-E Wire and Cable engineers can offer a special combination of insulating materials and jackets to do the job.

Whatever your control cable problem, General Electric can help you find the best answer. See your local G-E Wire and Cable specialist, or write Section W 181-627, Construction Materials Division, General Electric Company, Bridgeport, 2 Conn.

*Registered Trade-mark General Electric Company

Progress Is Our Most Important Product

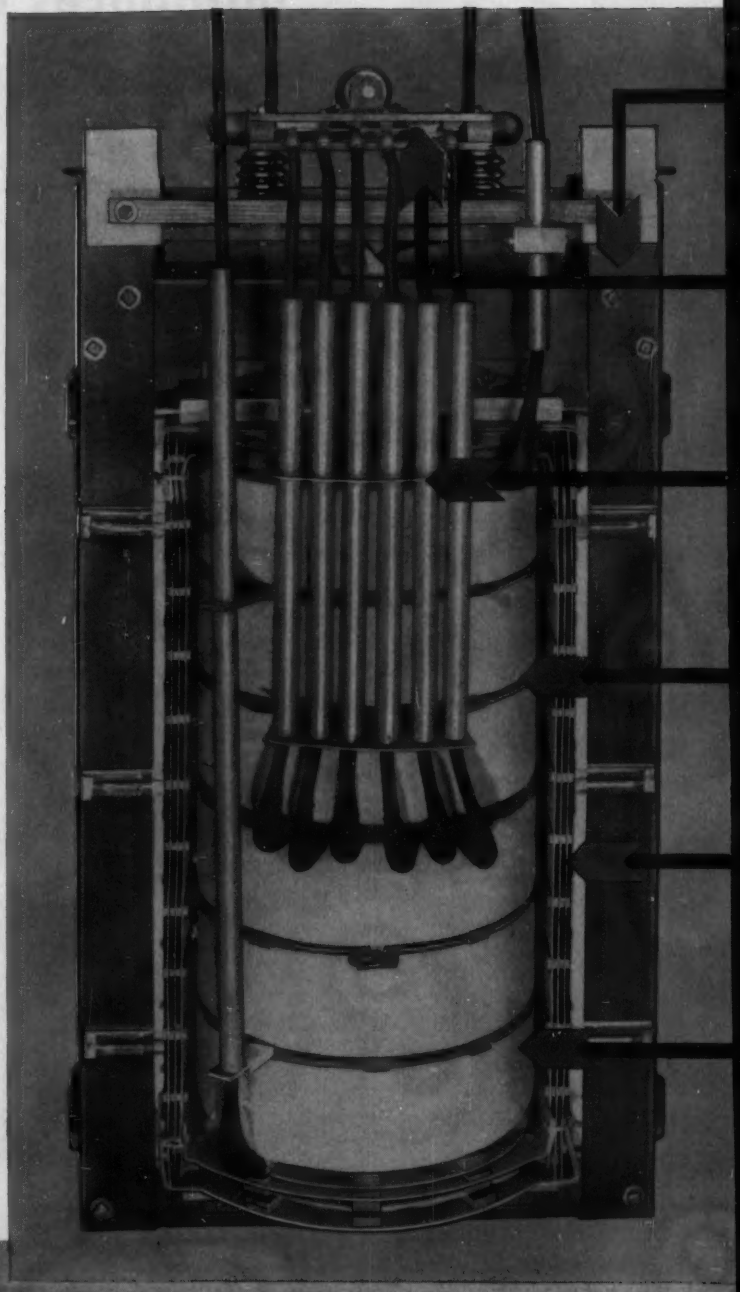
GENERAL ELECTRIC

Internal Ruggedness..

POLE STAR

As a general rule, the higher the voltage, the more essential it is that transformer service be continuous and trouble-free. This is true from the standpoint of economics as well as that of customer satisfaction . . . and it is why Pennsylvania gives you *extra* ruggedness where it counts the most, in high voltage Pole Stars.

Take a look at the interior design features shown on these pages and see for yourself. From the patented lap-on-top core to little noticed lead supports, Pole Stars are designed and constructed to deliver *sustained performance* in every type of transformer installation. You can rely on Pole Stars for long range economy and dependability throughout the complete range of EEI-NEMA ratings: through 500 kva, through 67,000 volts, single phase. Pennsylvania Transformer Division, McGraw-Edison Co., Canonsburg, Pa.



The unit pictured is 500 kva. High voltage: 67,000 volts. Low voltage: 7560/13,090Y volts. Construction features shown may vary somewhat in other voltage classes.

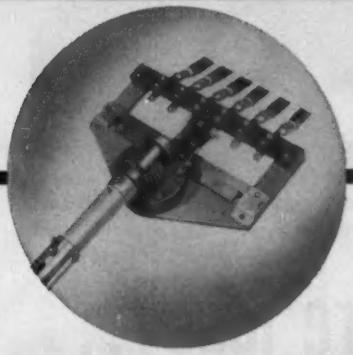
PENNSYLVANIA TRANSFORMERS pt

PENNSYLVANIA

key to sustained performance of high voltage

POLE STARS

ANGLE-AND-CHANNEL CORE FRAME

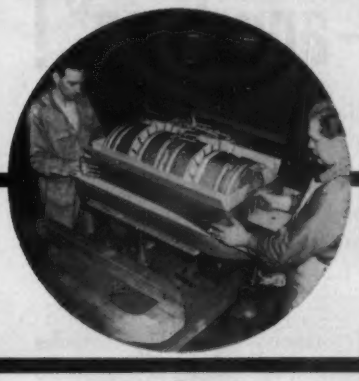


Core-and-coil assembly is supported by a sturdy, pressed steel, angle-and-channel frame, which is securely fastened together by bolts with permanently positioned nuts.

STRAIGHT-LINE TAP CHANGER

Straight-line tap changer is of same rugged design as that featured for years on Pennsylvania Power Transformers. Sintered silver-nickel contacts possess electrical qualities of silver and wearing characteristics of nickel.

INTEGRAL LEAD SUPPORTS

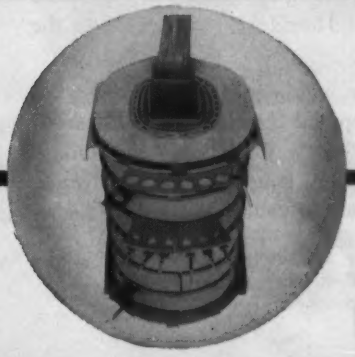


High voltage leads are insulated in pressboard tubing and held firmly in position by supports that are an integral part of the coil.

LAP-ON-TOP CORE

Core features Pennsylvania's patented lap-on-top construction. Laminations are individually lapped, creating a large cross-section area at lap that reduces density and prevents concentration of flux. Absence of gaps or butt joints assures low exciting current.

INSULATION AND BRACING

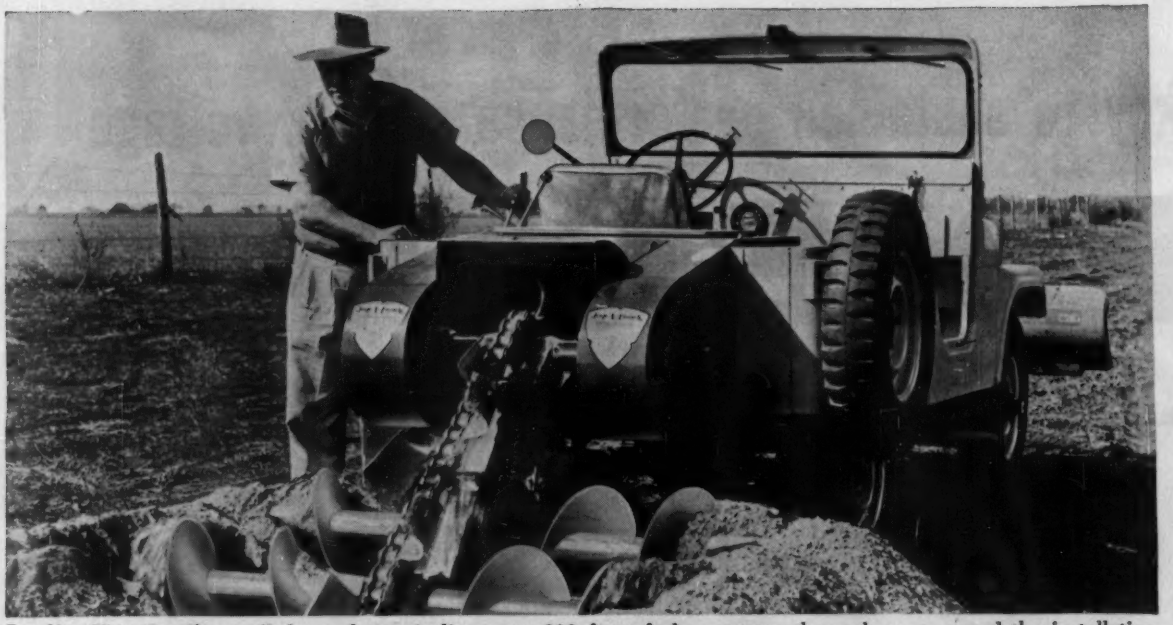


Coils are "packed out" with insulation to securely lock core and coil together. Maple braces provide extra support at top and bottom and help to protect against possible short circuit forces.

SECTIONAL COIL

High voltage windings are sectional, with low voltage layer windings inside. Use of sectional coils in higher voltages improves insulation . . . permits weight and size reductions. Also results in uniform distribution of impulse voltage and greater resistance to short circuit.

DISTRIBUTION TRANSFORMERS



Trenching. This 'Jeep'*-propelled trencher unit digs up to 800 feet of clean-cut trench per hour, to speed the installation of cable, conduit and service lines. With the accelerating trend to underground lines, the 'Jeep'-trencher unit becomes increasingly important in electrical industry service.

Versatile 'Jeep' vehicles do more jobs... GO "anywhere—any time"!

Maintenance. The 'Jeep' Truck is the *only* time-tested and performance-proved 4-wheel drive truck in its weight class. Its 4-wheel drive traction takes equipment and crews to trouble spots in storms or other emergencies.

All-New Forward Control 'Jeep' FC-150 Truck. It's the first time a 4-wheel drive truck has so effectively combined so much cargo capacity (74" pickup box), with such exceptional "go-anywhere" maneuverability (81" wheelbase).

Versatile "go-anywhere" 'Jeep' vehicles help assure uninterrupted, 'round-the-clock electrical service.

They have the all-wheel traction to go almost anywhere, to serve on job after job 24 hours a day. These rugged vehicles reach out-of-the-way line installations or patrol the right-of-way, in good weather or bad—wherever line service or maintenance is needed.

With power take-off, performance-proved 'Jeep' vehicles operate many types of special equipment from winches to sprayers for weed control. They take power right to the job—on the road or off.

Rugged 'Jeep' vehicles are functionally designed to withstand the toughest use...spread their cost over hundreds of different jobs from stringing high lines to installing meters. And their low upkeep, long life and high resale value provide extra savings. See your Willys dealer for an on-the-job demonstration today.

The 'Jeep'®

family of 4-Wheel-Drive vehicles

WILLYS...makers of the world's most useful vehicles

**Model CJ-5 shown*

WILLYS MOTORS, INC., TOLEDO 1, OHIO

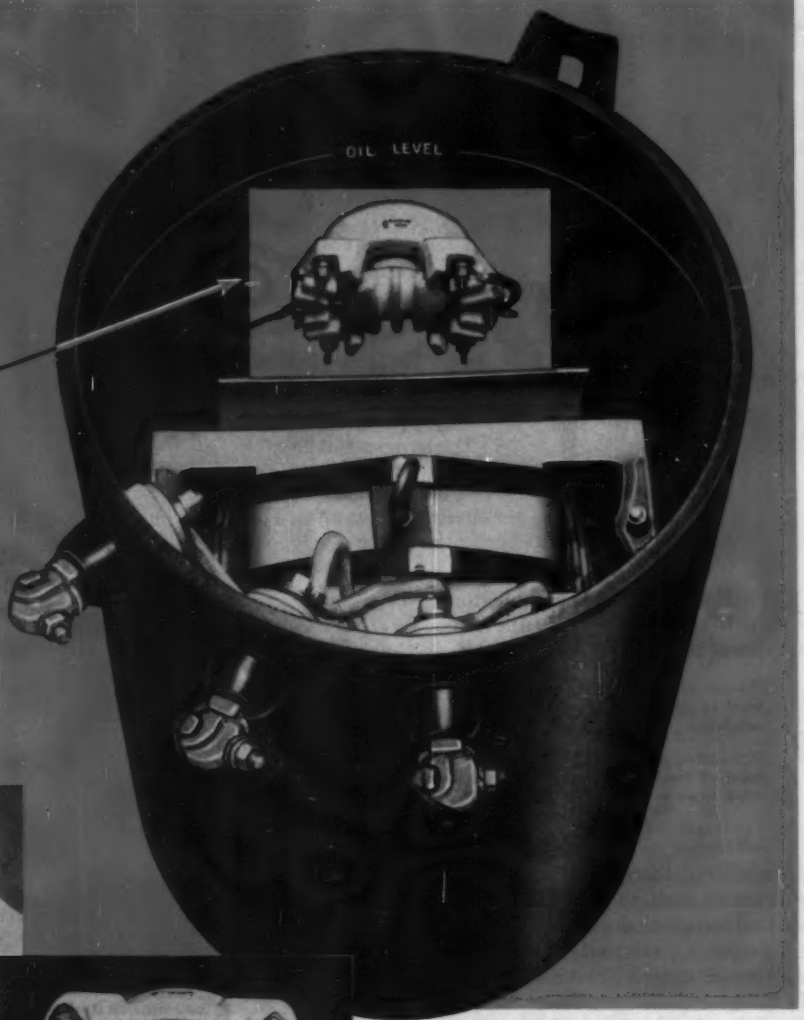
DUAL VOLTAGE transformers
MEAN SAVINGS IN MONEY, TIME, LABOR

You save in stocking requirements . . . one unit can be stocked where it now takes two.

You save transformers from obsolescence when system voltage is increased.

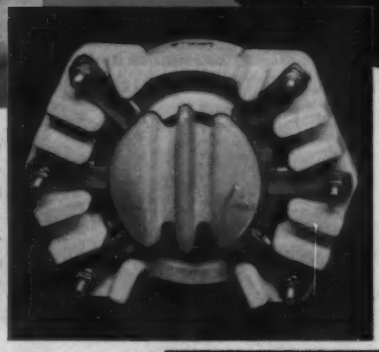
You save on change-over, cutting both down time and labor time.

Voltage change-over switch is mounted on the inside of the tank, under the oil level. It is fully operable from outside the tank.



Switch is sealed and protected from damage by removable screw cap and neoprene gasket.

Simple operation! Remove screw cap and reverse, using cap as handle for rotating switch.



Switch is rotary-bridging-to-position type, with both positions clearly identified by a stamped plate on the switch. Body constructed of wet process electrical porcelain with ample creepage. Fully impulse tested by NEMA standards.

For positive protection against puncture, flashover, or lightning failure the entire transformer is always insulated for the basic insulation level of the highest name plate voltage.

Available in	**2400 x 4800 volt** **2400 x 7200 volt** **4800 x 14,400 volt** **7200 x 14,400 volt**	**from 10 through 100 KVA.**

Like all RTE Transformers, dual voltage models are backed by a five year guarantee. They are available from conveniently located warehouses throughout the U.S.

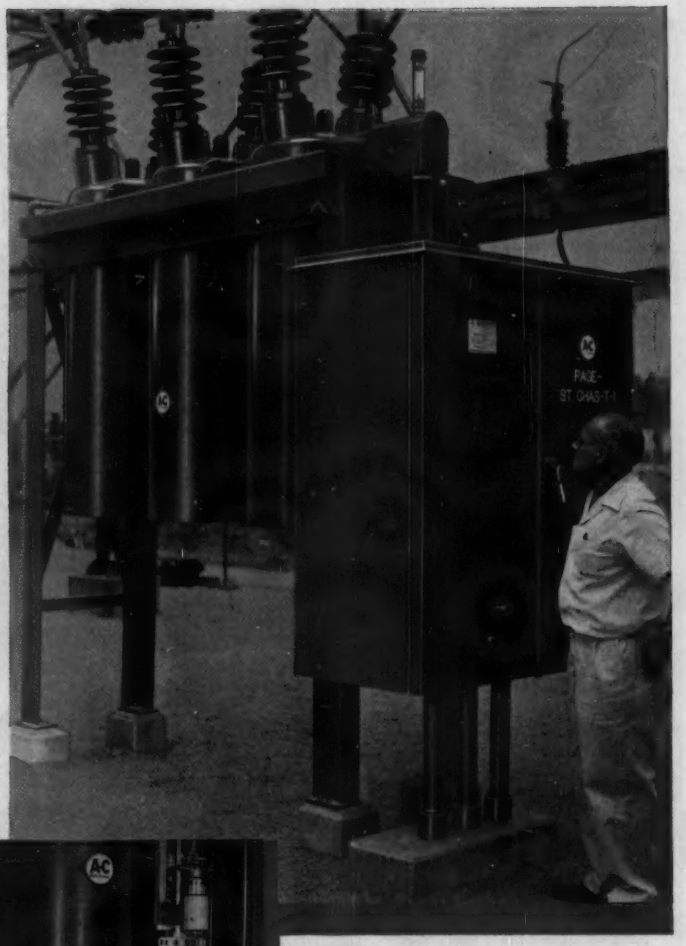
HELPING PROVIDE POWER FOR AMERICA

RT&E CORPORATION
WAUKESHA, WISCONSIN

ALLIS-CHALMERS

"F Z O" frame-type breaker

Has 3 Features You Want Most!



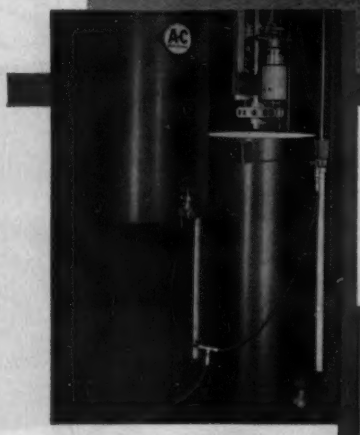
HERE are the outstanding features utilities enjoy with this Allis-Chalmers frame-type breaker.

Pneu-Draulic **operator provides last word in simplicity — ease of inspection — reliability.**

Power-operated hydraulic tank lifter takes all the effort out of raising and lowering tanks — saves time.

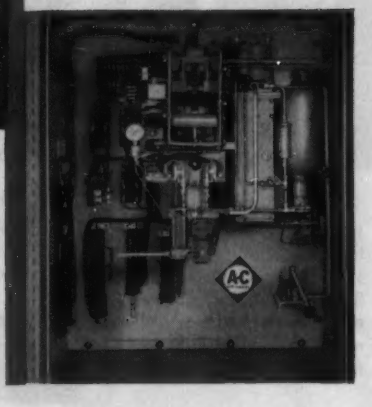
Turbo-Ruptor **interrupting device with self-aligning tulip and bayonet contacts.**

In addition, there are dozens of refinements, such as the side trip . . . new oil sampling device . . . float-type oil gauge . . . external adjustment of overtravel stop . . . ASA standard bushings . . . which make this the finest breaker in the field.



Power-operated hydraulic tank lifter.

Pneu-Draulic operator.

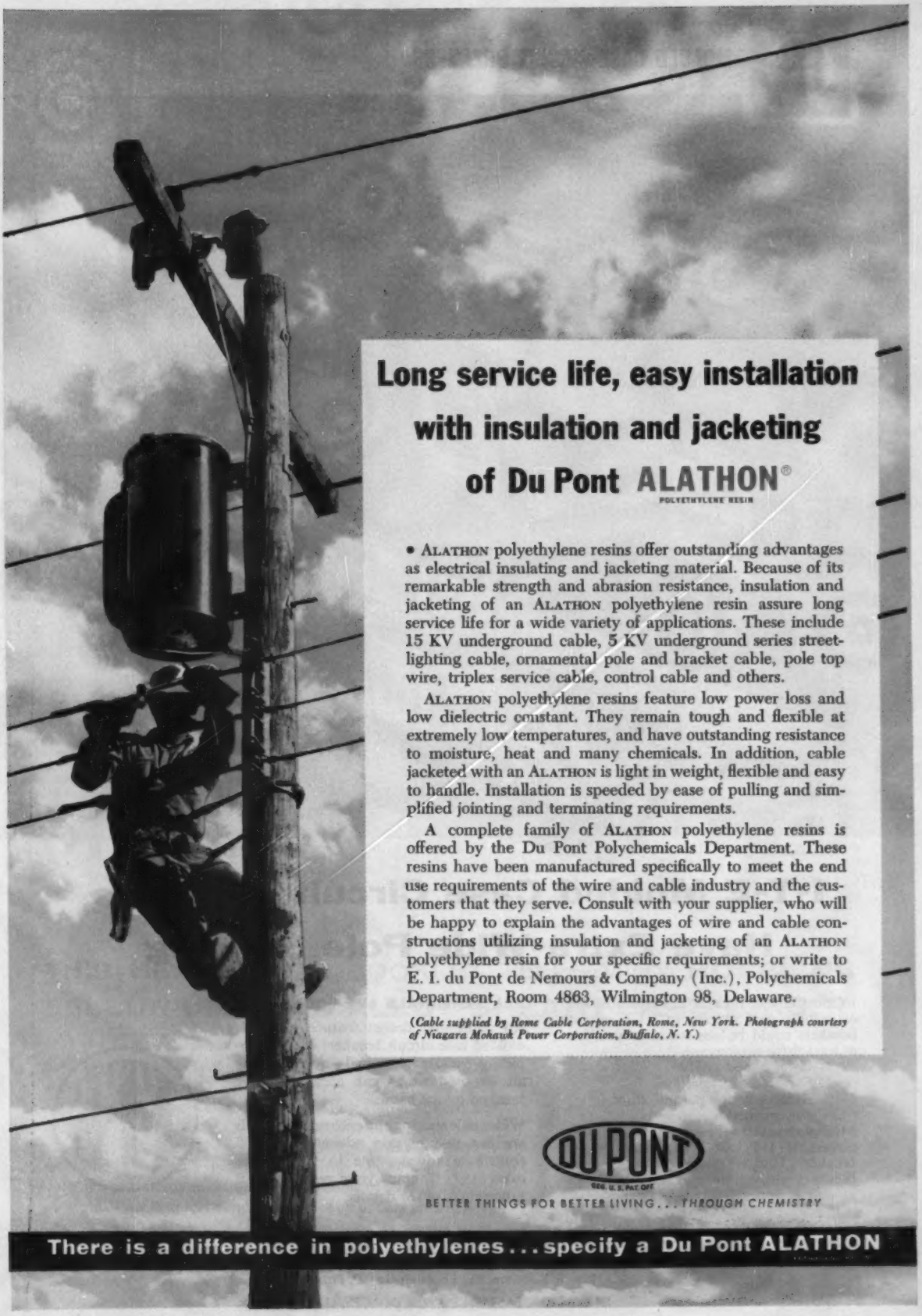


For complete details, call your nearby Allis-Chalmers office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pneu-Draulic and *Turbo-Ruptor* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-5417



Long service life, easy installation with insulation and jacketing of Du Pont ALATHON®

POLYETHYLENE RESIN

• ALATHON polyethylene resins offer outstanding advantages as electrical insulating and jacketing material. Because of its remarkable strength and abrasion resistance, insulation and jacketing of an ALATHON polyethylene resin assure long service life for a wide variety of applications. These include 15 KV underground cable, 5 KV underground series street-lighting cable, ornamental pole and bracket cable, pole top wire, triplex service cable, control cable and others.

ALATHON polyethylene resins feature low power loss and low dielectric constant. They remain tough and flexible at extremely low temperatures, and have outstanding resistance to moisture, heat and many chemicals. In addition, cable jacketed with an ALATHON is light in weight, flexible and easy to handle. Installation is speeded by ease of pulling and simplified jointing and terminating requirements.

A complete family of ALATHON polyethylene resins is offered by the Du Pont Polychemicals Department. These resins have been manufactured specifically to meet the end use requirements of the wire and cable industry and the customers that they serve. Consult with your supplier, who will be happy to explain the advantages of wire and cable constructions utilizing insulation and jacketing of an ALATHON polyethylene resin for your specific requirements; or write to E. I. du Pont de Nemours & Company (Inc.), Polychemicals Department, Room 4863, Wilmington 98, Delaware.

(Cable supplied by Rome Cable Corporation, Rome, New York. Photograph courtesy of Niagara Mohawk Power Corporation, Buffalo, N. Y.)

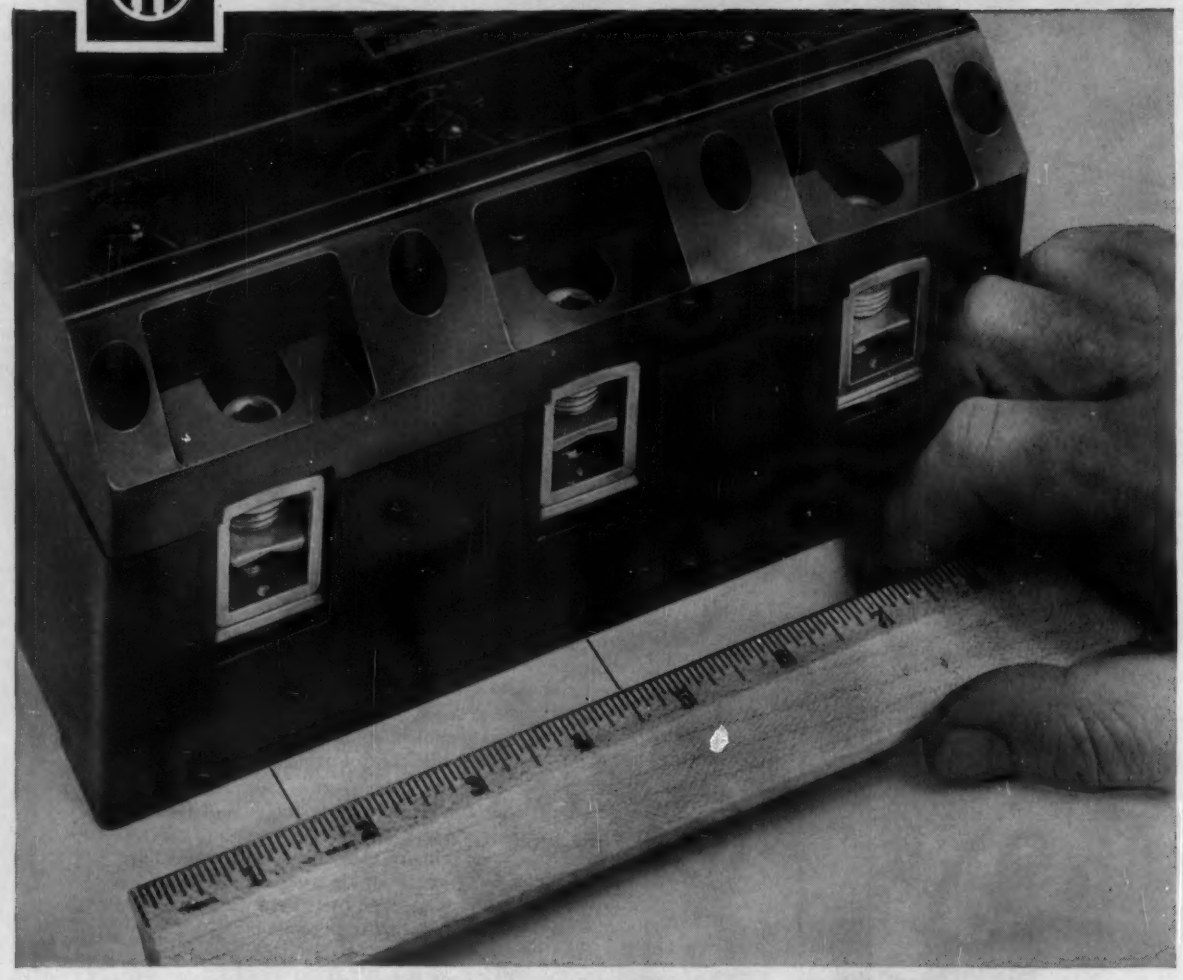
DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

There is a difference in polyethylenes . . . specify a Du Pont ALATHON

MOLDED CASE CIRCUIT BREAKERS



I-T-E Molded Case Circuit Breakers Have Extra-Wide Pole Spacing

In most circuit breaker applications, the extra-wide pole spacing in I-T-E circuit breakers could be important to you for at least three reasons:

1. Gives added safety
2. Facilitates installation
3. Breaker design permits sturdier construction

Minimum spacing between I-T-E pole centers is 1½ in.—3 in. in all larger breakers. Thus I-T-E molded case circuit breakers give you the maximum in design as well as in performance.

ALL TERMINALS ARE ENCLOSED

An additional design feature of I-T-E molded case circuit breakers is the completely enclosed terminal—no live parts are exposed which can accidentally be touched by the hand.

Wider pole spacing and enclosed terminals are but two built-in advantages which contribute added value to you—at no extra cost. Contact your nearest I-T-E representative for details.

I-T-E CIRCUIT BREAKER COMPANY • Small Air Circuit Breaker Division

19th & Hamilton Sts., Philadelphia 30, Pa.

IN CANADA: EASTERN POWER DEVICES, LTD.

GET THE INSIDE STORY...

THIS NEW 8-PAGE BOOKLET TELLS WHY **ROEBLING TELLURIUM LEAD ALLOY SHEATH** LASTS LONGER!

90% less creep... 4½ times greater bending life... unusual stability under heat... negligible age-hardening—you've read how Roebling Tellurium Lead Alloy Cable Sheath has all these favorable, life-saving qualities, and more. Now the full story, complete with useful technical data, is told in an illustrated 8-page bulletin that's free for the asking.

Learn how cable maintenance problems can be materially reduced, with savings. Send for your copy of this informative book today!

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Please send me your new Tellurium Lead Alloy Sheath Facts Book.

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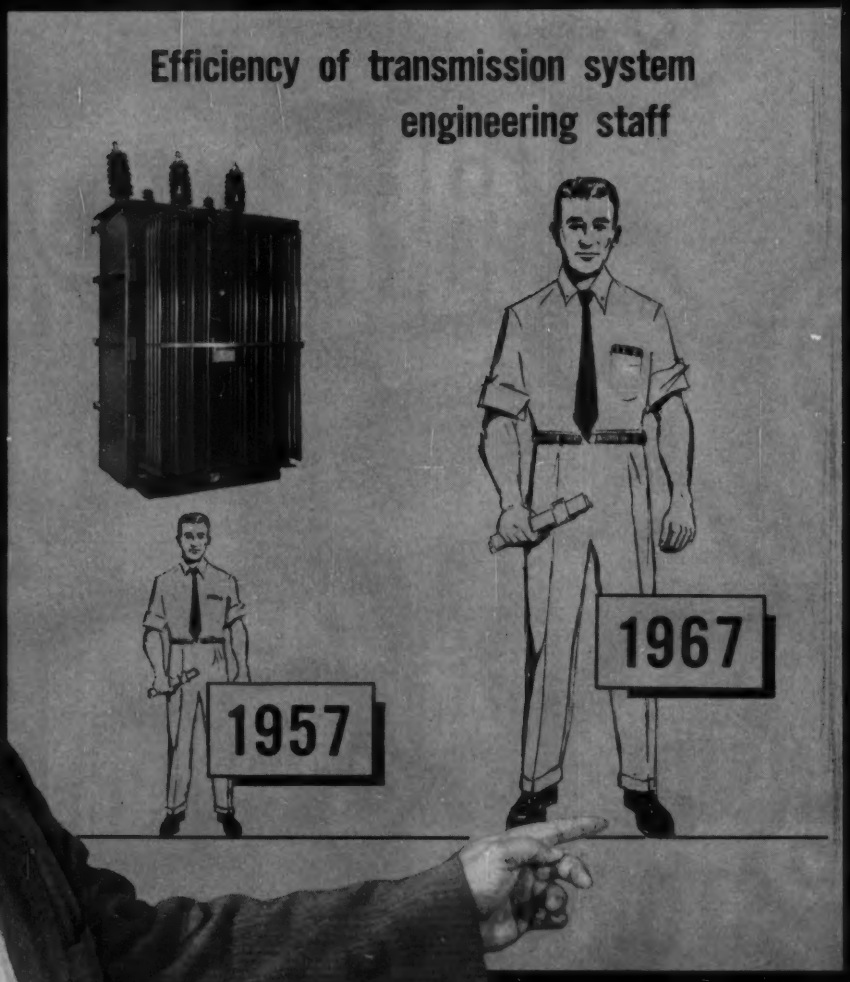


DOUBLED EFFECTIVENESS of each transmission-system engineer by 1967! T. F. Volkmer, General Electric's Medium Transformer Department manager of engineering, predicts this manpower-economizing benefit as a result of full acceptance by utilities of standard-design medium transformers (501 to 7500 kva, 69 kv and below).

A GENERAL ELECTRIC 10-YEAR FORECAST:

Medium transformer standardization to double efficiency of transmission-system engineers

In 1967, electric utilities' transmission-system engineers will be largely relieved of medium-transformer design details; one man in this field will be as productive as are two today. Engineers will thus be freed for more challenging work, and utilities will be able to meet the future's heavier technical needs with fewer engineers than would otherwise be required. So forecasts T. F. Volkmer, manager of engineering at General Electric's Medium Transformer Department in Rome, Georgia.

What will make this greater productivity possible? This: utilities' continued acceptance and application of standard-design transformers. For, when standard-design units are adopted for all systems, only the most basic information (such as kva, high-voltage, and low-voltage ratings) will be needed to specify additional transformers. This simplified ordering procedure will relieve your valuable engineering personnel of time-consuming details of transformer design and specification.

YOU GET REAL BENEFITS TODAY!

You can realize the benefits of simplified ordering and reduced design time, *now,* by specifying General Electric RM (Repetitive Manufacture) transformers. These standard-design units also offer:

Faster shipment—Ten-week shipment is now average for General Electric RM medium transformers. This compares with an industry average of more than 16 weeks for specials.

More and better features—Standard design makes it economically possible for G.E. to offer such extras as Formex* insulated windings, control-center arrangement of instruments and accessories, reversible junction boxes, and many others.

Higher quality for longer life—G-E repetitive manufacture techniques permit 18 assembly-line tests and 22 quality-control inspections during manufacture, to assure dependable operation over a long service life.

G.E.'S BROAD RANGE OF STANDARDS HANDLES 90% OF ALL JOBS

If your company is not yet taking full advantage of the benefits of medium transformer standardization, act today. Ask your G-E Apparatus Sales Engineer to show you how G.E.'s broad range of standard RM medium transformers can meet the large bulk of your needs, and also work efficiently with older, special transformers now on your system. General Electric Co., Schenectady, N. Y. 416-11

*Reg. Trade-mark of General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC

WAGNER TRANSFORMERS...THE CHOICE OF LEADERS IN INDUSTRY

This shopping center consumes enough electricity to supply 25,000 homes

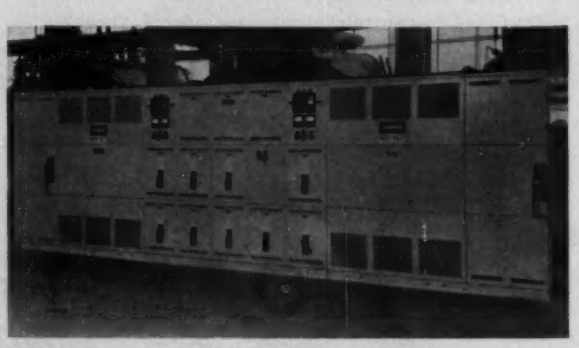
Here are 161 acres of shopping convenience—the Northland Center development of the J. L. Hudson Company in suburban Detroit. The branch department store and some 80 other Northland Center stores use electric power for interior and exterior lighting, elevators, conveyors, escalators, pumps and blowers, and compressors for air conditioning and refrigeration.

So great is this shopping center's demand for electricity that the Detroit Edison Company has built a substation there large enough to supply the electrical needs of 25,000 homes.

Eleven double-ended substations, rated 1500 and 2000 kva, are required to distribute this electric power. Each unit substation is equipped with two Wagner dry-type transformers which meet all requirements for safe indoor installation because they are fireproof and explosion-proof.

Wagner Transformers play an important role in supplying power to many major businesses and industries so they can work better electrically.

Why not discuss *your* next indoor or outdoor transformer installation with a Wagner engineer? Call the nearest of our 32 branch offices, or write us.



This Wagner-equipped Unit Substation is installed in Northland Center utility house for 4800-480 volt power distribution.

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

W757-7

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

...AN IMPORTANT STEP IN RELIABLE DEADEND CONSTRUCTION

use insulators and hardware made together to perform together

This scene probably takes place many times a day in your system . . . insulators and hardware are being made up into distribution deadends.

It isn't always true, however, that both insulators and hardware come from one manufacturer as these do. One manufacturer means one responsibility for performance. It means a basic understanding of the problems of making porcelain and metal work together, of how to eliminate potential sources of trouble, and of how to make installation as convenient as possible.

Insulators and hardware constitute a small part of the cost of building a distribution line. But they're an important part . . . deserving of the best materials available. Such materials come from Ohio Brass, the one company making both insulators and hardware.

Ohio Brass

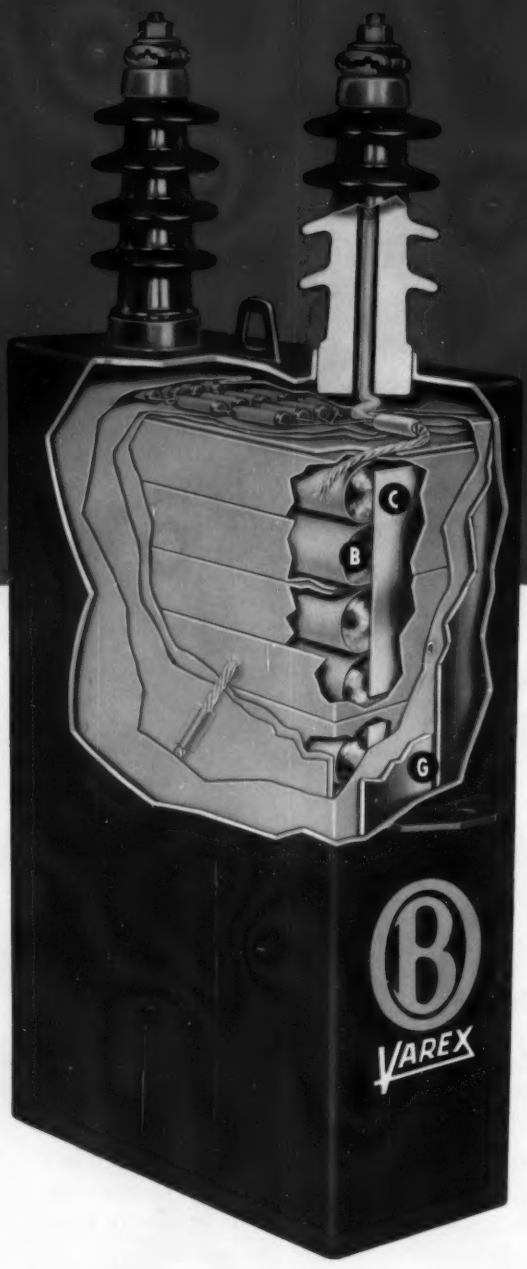
OHIO BRASS CO. • MANSFIELD, OHIO

for better capacitor performance...

here's how extended foil, spring pressure work together to make

Looking down on one side of a Varex capacitor. Element is (A); extended foil (B); contact plate (C); element separator (D); pack envelope (E); spring carrier (F); springs (G); and capacitor case (H).

Working through the flexible secondary insulation, the springs press the contact plate firmly against the foil at the end of the element, putting the plate in contact with every layer of foil.



EFFECTIVE ELECTRICAL CONTACT

in VAREX capacitors

Besides reducing hot spot temperature, the extended foil principle use in Varex capacitors is extremely effective in establishing an electrical contact system.

The illustration at the far left shows how contact is made with the end of the Varex elements. Parallel steel springs (G), working through flexible secondary insulation, press a broad contact plate (C) against the extended foil (B).

This system offers these basic advantages, among others:

1—Each turn of foil is in contact with the plate. As a result, current density is nearly uniform throughout each foil. Maximum current flow distance in the element is only about the width of the foil.

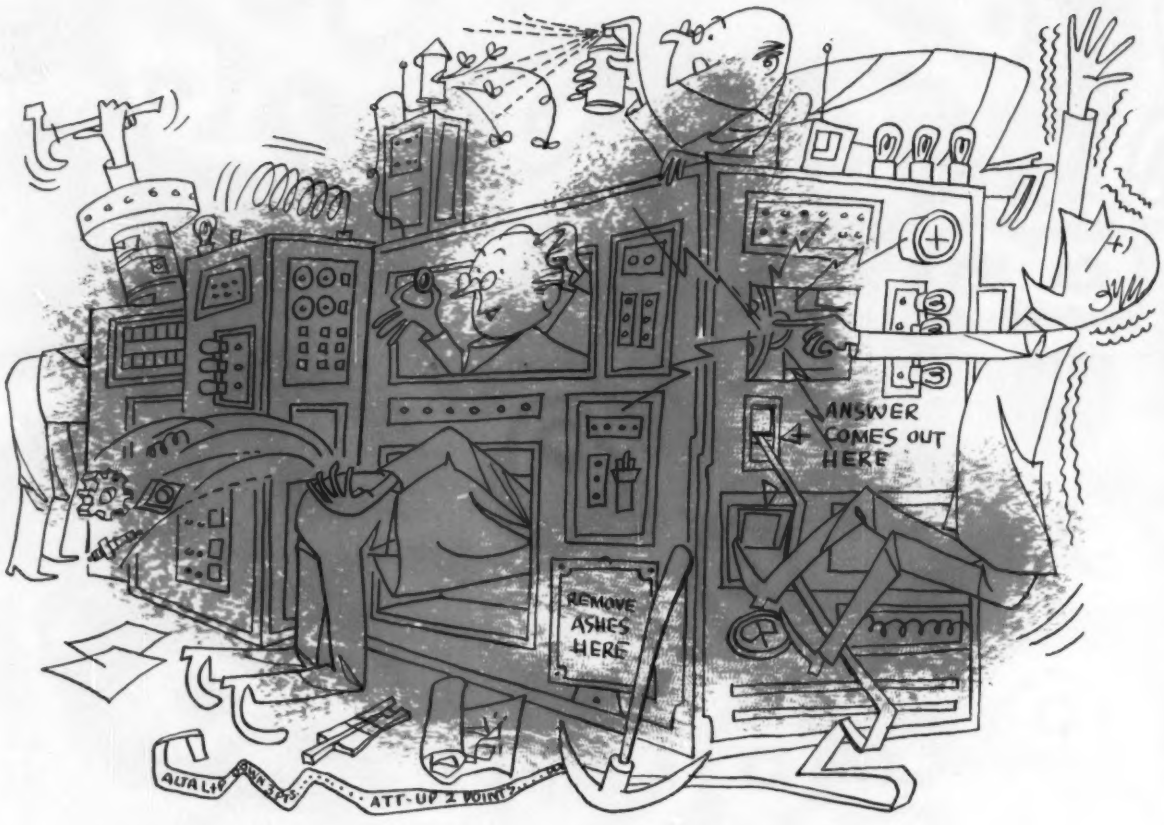
2—Because of the large contact area, current densities are also low at the foil-contact plate junction . . . an important advantage during system transient conditions when currents may be several times rated currents.

3—There is no need to interrupt the winding of elements to insert contact plates. This makes winding tension easier to control, and eliminates risks of injuring the dielectric, of crowding it, and of placing contaminating material on it.

Besides these advantages, there are the inherent simplicity and freedom from trouble that are characteristic of a pressure-followed contact system.

Perhaps you would like to know more about Varex and the many worthwhile features that contribute to its long, efficient life. Ask your O-B representative to discuss these Varex features with you.

Ohio Brass



Remember the Lightning-Vac?

While we're getting rid of a few bugs, stick with O-B Insulators.

Several power company customers seem to like the idea of a Lightning-Vac, a mythical device for telling at what time and location lightning is going to strike a distribution line.

"Let's order a half dozen."

"Why didn't you think of it before?"

"Are the ashes good for fertilizer?"

These have been a few typical comments and questions.

Naturally, in the face of such customer approval we've charged ahead with our design work. Unfortunately, there are quite a few bugs to be worked out.

In the meantime, we suggest you stick with O-B insulators on your distribution lines. They've been tested and found able to withstand man-made lightning with twice the rate of voltage rise of natural lightning.

It's our contention that the best protection against lightning is an insulator that won't puncture. So while the Lightning-Vac is being developed, stick with O-B insulators, conveniently available from your nearby Graybar house.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

Distributed by GraybaR ELECTRIC COMPANY

4755-H

EDITORIALS

Crane Contact Accidents Must Be Cut!

Accidents involving contacts between cranes and power lines are rapidly becoming an acute problem and one that merits a united safety drive by construction contractors, utilities, crane operators' unions, and insurance companies.

The number of fatalities and injuries is alarmingly high. In California alone, where more has been done than in some states to correct the problem, there were 160 killed and 300 injured in a five-year period.

Past efforts focused on the problem have helped, but nothing has been found that gets any real results. Alarm systems that warn when a crane boom approaches a power line have helped; so have cautionary signs in crane cables. There have been concentrated activities by individual utilities that have alleviated the problem in local areas. But the fact remains that country-wide, today, too many people die each year from this cause.

Prospects are that the toll will increase before it decreases. The federal highway program is likely to be a heavy contributing factor as more and more cranes operate in the vicinity of overhead lines.

The electrical character of the crane contact problem suggests that safety groups within the electrical industry should assume leadership in any safety drive reaching across industry lines. Officials of the crane operators' union have already offered complete cooperation, and help from the construction industry and insurance groups is to be anticipated.

The stake of the electric utility industry in reducing crane contact accidents is a major one. Apart from and in addition to the matter of personal hazard, cranes are causing extensive damage to lines and are a serious source of interruptions to service. Electric companies should assert leadership in a united safety drive to cope with crane contact accidents.

The Electrical Historical Foundation

For the purpose of promoting interest in and appreciation of electrical engineering and the electrical industry, especially among the youth of America, The Electrical Historical Foundation has been organized.

Specifically the Foundation expects to locate, preserve, and encourage the public display of historical electrical equipment, memorabilia, photographs, and printed matter. The activities will encompass a very broad field of electrical interests including electronics, illumination, power, railway, communication and utilization equipment.

The Electrical Historical Foundation will not compete with, duplicate, or replace the activities of the country's important museums. It will support all such activities and supplement them in such ways as seem appropriate. We in the electrical industry cherish our heritage and wish to preserve it and strengthen it for future generations. Through the Foundation, which was organized by dedicated members of the industry, we have an organization in being to carry on this important work.

The Historical Electrical Foundation will need modest support from all segments of the industry to carry on its stated objectives. We believe them to be worthwhile and recommend your support.

It's A Wonderful Business

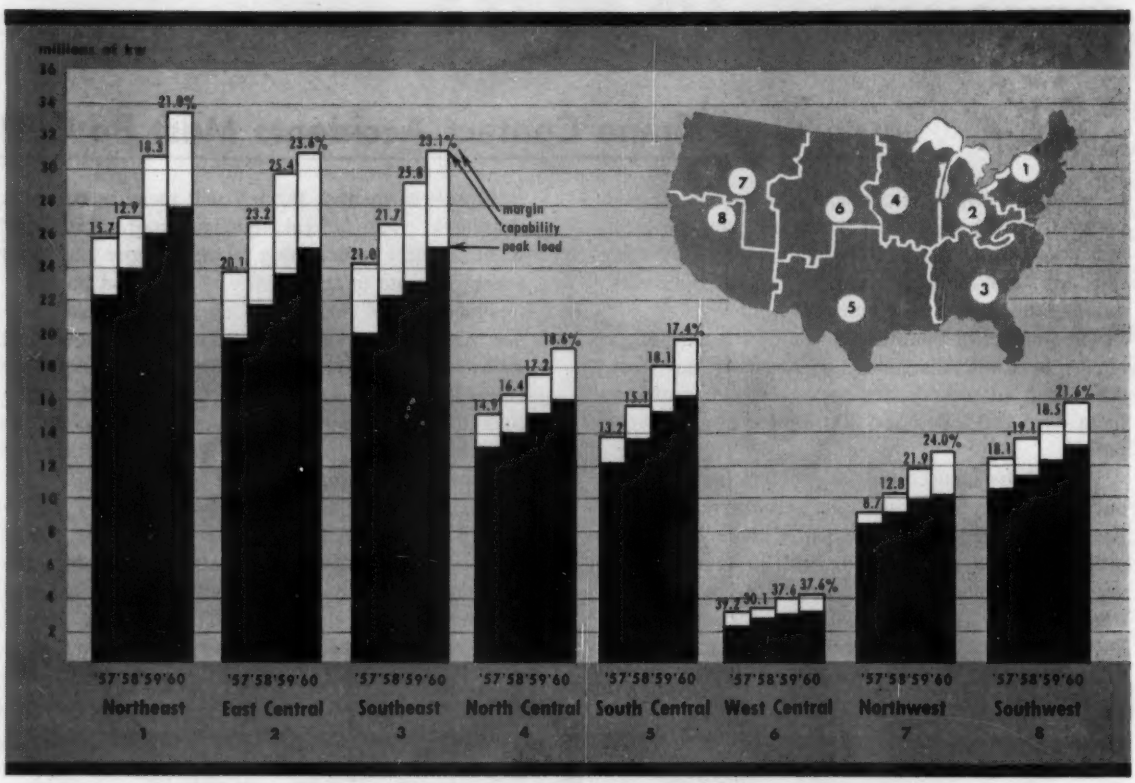
"We will recommend to our customers only those uses of electric service which increase efficiency, production, or profit in their business or enrich living in their homes."

This excerpt from the published policy of an electric company set us to pondering what this statement meant. And the longer we pondered the more convinced we became that it meant this company intends to promote every known application of electricity.

When we got right down to weighing the ultimate value of electricity in industry, commerce, the home, and on the farm, we couldn't think of even one application that would be in conflict with the policy. Electric service properly applied always increases efficiency, production, or profit in business (it often does all three) and enriches living in the home.

It's a pretty wonderful business to be in when the product you sell helps everybody to do more things better, make more money, and get more out of life.

A product like that ought to sell itself. But the fact remains that it doesn't. You still have to Sell . . . Sell . . . and Sell.



Estimated summer margin for nation, 17.3% this year, 18% next year while . . .

Industry Trims Back Peak Load

- **Both summer and winter margins for next three years edge upward since last semi-annual survey**
- **About 1 million kw of capability deferred until 1958 when additions of 17 million kw are planned**

Edison Electric Institute's twenty-first semi-annual power survey released last week showed these significant shifts in industry forecasting over the past six months:

• Summer margins of capability over peak load have been revised upward for this year and 1959. It remains the same—18%—for 1958.

• December margins are also estimated to be wider than were shown in the survey of last November. Tightest margin of 15.5% is forecast for December of this year, but earlier forecast had been for 14.8%.

• Capability additions for this year have been revised downward by 1 million kw—from 9.4 to 8.4 million kw. These are deferred to next year when an estimated 16.9 million kw is to be added.

• December peak-load estimates have been revised downward by 1.7 million kw for 1957, 572,000 kw for 1958, and 267,000 kw for 1959.

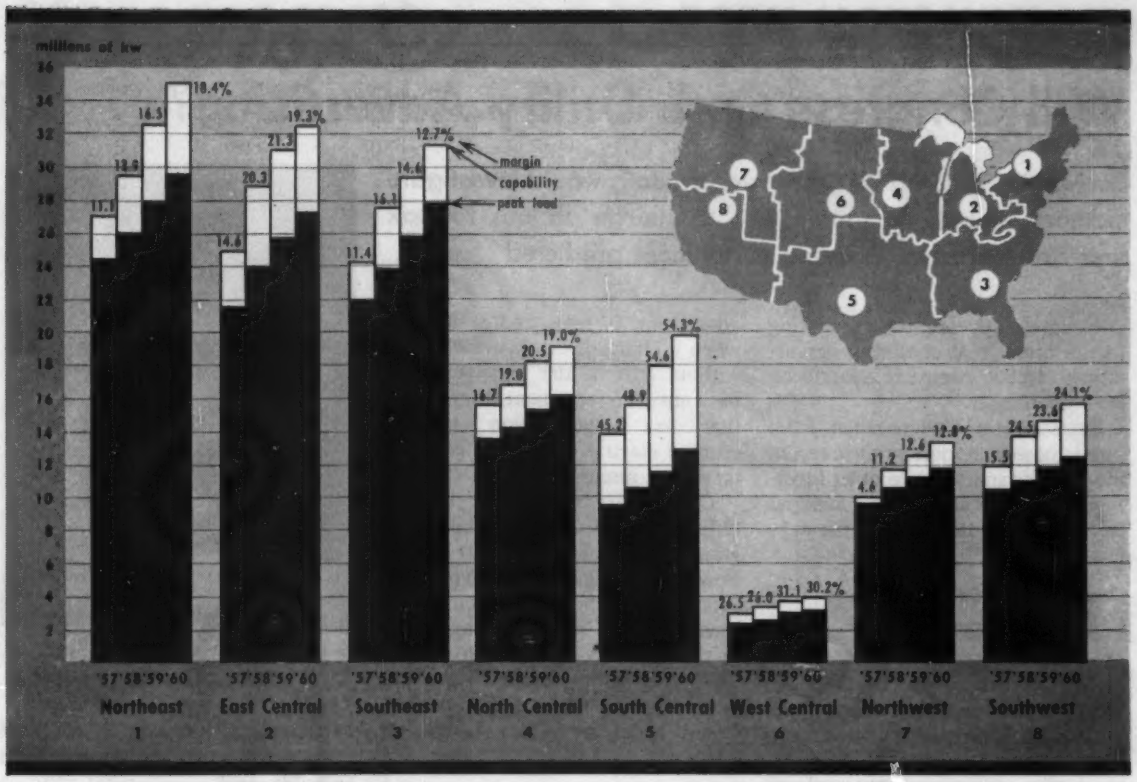
• Output forecasts have been trimmed for this year and next but revised upward for 1959.

• Estimates of annual load factor have been revised downward for the next three years—showing a constant 63.6% as compared with earlier estimates ranging from 64.9 to 65.1%.

Charts above show results of the most recent survey—the estimated peak loads, capability, and margins for each of the eight regions over the next four years. They assume median water conditions.

Milder weather last year which kept down December peaks, along with a leveling out of industrial production, may have influenced the shifts in estimates during the intervening period. But the tight money situation also may have deferred some generation expansion, particularly in light of the revised peak load estimates.

Next year's scheduled capability additions are substantially increased in the latest estimates. The survey of last November showed planned additions of 15.9 million kw in 1958. The latest survey ups the figure to nearly 17 million kw. Practically all of this increase is accounted for by the deferment of nearly 1 million kw of additions this year. In any event 1958 now shapes up as a record year for generation additions, but whether the industry will be able to realize fully its plans for an additional 16.9



. . . winter margins also climb from 15.5% this year to 20.2% in 1958 as . . .

Estimates, Defers Additions

million kw will depend on good construction weather and prompt equipment deliveries.

The North Central and Northwest regions will have installed more capability to meet this winter's peaks than they had planned at the time of the last survey. The Southeast, North Central and Southwest regions now have more capability scheduled to meet this summer's peaks than was scheduled at the time of the last survey. The cutbacks have come in the other regions.

Output Figures Also Down

A slowing down of the climb in industrial production and the cutback in housing starts may account partially for the downward revision in output forecasts. Latest survey gives these output forecasts: For 1957, 646.9 billion kwhr; for 1958, 703.5 billion kwhr, for 1959, 757.3 kwhr. The 1957 and 1958 figures are down some from the previous survey, but the 1959 figures are revised upward.

Annual load factors have taken a slight turn for the worse since the survey of last November. The current survey shows them at 63.6% for 1957, '58, and '59, and down a notch to 63.4% in 1960. Previous forecasts had been for annual load factors of 65% this year, 65.1% in 1958, and 64.9% in 1959.

The table here depicts the trend toward a yearly summer peak from the December peak that has been traditional in the industry. Note that the South Central region is considerably beyond the changeover point and that the North Central region will approach the changeover by 1960.

Summer Peak as % of Following December Peak

Region	1956	1957	1958	1959	1960
1. Northeast	91.5	92.0	92.5	93.4	93.9
2. East Central	91.7	91.6	91.3	92.9	92.5
3. Southeast	96.0	92.2	92.5	90.7	91.4
4. North Central	97.14	97.4	98.1	98.6	99.1
5. South Central	124.0	127.6	128.6	130.2	130.0
6. West Central	98.8	95.4	95.8	96.2	96.5
7. Northwest	82.8	86.6	86.5	86.6	86.4
8. Southwest	96.9	100.7	102.1	102.3	102.7
Total U. S.	**95.7**	**96.0**	**96.4**	**96.9**	**97.2**

Will Congress Curb Utility Advertising?

Current probes, led by Kefauver, Chudoff, would investigate methods electric companies use to charge off ads for tax and rate purposes; possible curtailment predicted

Congress appears to be preparing for an attempt at censoring or curtailing electric company advertising in some manner.

Pressure on Congressmen from public power supporters over recent months has sparked two quiet investigations aimed at gathering material to hold public hearings on the subject.

Commissions Submit Reports

Sen Estes Kefauver (D-Tenn.) is receiving reports from all the state regulatory commissions on the manner in which electric company advertising is charged for rate and tax purposes. He expects to have all the replies within another couple of weeks.

Previously, Kefauver had also requested the Internal Revenue Service to report to him on the manner in which certain advertising was treated for income tax purposes. Officials are conducting a field investigation to get the answer.

In the House, Rep Earl Chudoff, chairman of the public works and resources subcommittee of the House Government Operations Committee, is preparing his own investigation of electric company advertising. Last week Chudoff received a report from the Federal Power Commission covering how about 50 electric companies charged the expense of buying and distributing certain booklets.

ECAP Campaign Is Bull's Eye

The main target is the Electric Companies Advertising Program campaign. But the attack will also be aimed at local situations, such as advertising involved in the defeat of the Stevens County PUD by Washington voters in 1955.

Closely tied in with the attack on advertising is the controversy over fast tax amortization certificates for electric utilities. Public power advocates argue that electric company advertising is false and fraudulent when it claims it can provide power without cost to the taxpayer. To back up their argument, they assert that tax amortization benefits granted electric companies cost the taxpayers money.

Critics cite the action by the Office of Defense Mobilization granting fast write-offs to Idaho Power Co for its Snake River projects. Foes of the electric companies then cite an ECAP ad that appeared in the Saturday Evening Post May 26, 1956, in which the claim was made that the Idaho Power project would save taxpayers a total of $465 million.

Ellis Seeks Probe by FTC

In addition to the pressure on Congressmen to look into utility advertising, regulatory agencies are also being approached. Clyde Ellis, Washington representative of the electric co-ops, is attempting to have the Federal Trade Commission investigate what he calls "false and fraudulent" electric company advertising.

He recently wrote FTC Chairman John W. Gwynne requesting that electric company advertising be investigated. Gwynne replied that an investigation would not be practical. He suggested that since the issues appeared to be political it was a matter for Congress and state legislatures to handle.

Critics Cite Alternate Goals

Critics hope, if the editorial content of the advertising can't be controlled, to make it financially painful for the companies involved to undertake it—by prohibiting companies from charging advertising as an operating expense.

Instead, if the ads were clearly chargeable to company profits, stockholders could then claim some prerogative for opposing them. This has been the case with stockholder

SEN ESTES KEFAUVER

J. Raymond Dyer and Union Electric Co and other utilities in which he holds stock.

The FPC is also involved but reports that an advertising charge has never been an issue in any electric rate case.

Under the uniform system of accounting administered by FPC, advertising designed to promote the sale of electric energy is charged as an operating expense under Section 787.2.

NARUC Recommendation Hit

There is another provision specifically for charging the type of advertising which is now under fire. In 1945, an accounting committee of the National Association of Railroad Utilities Commissioners issued a recommendation covering non-promotional, goodwill, or institutional advertising aimed at fostering public goodwill.

In cases where such advertising is intended to influence public opinion in the election or defeat of a public officer, the defeat of existing laws, influencing the decisions of public officers, and so forth, NARUC recommends that it be charged under Section 538, miscellaneous income deductions. Since this is a "below the line" deduction, it would, in effect, be chargeable to the company's stockholders.

AEC Compares British-U. S. Reactor Costs

"Advanced" Calder Hall, if built here, would have slight operating edge over PWR

A recently released study sponsored by the Atomic Energy Commission has disclosed that an advanced British Calder Hall gas-cooled reactor would have a slight operating cost advantage over a similar sized U. S. pressurized water reactor if constructed here in the United States.

The study, made for AEC by American-Standard Atomic Energy Division, was of "second generation" designs of 90,000 electrical kilowatt capacity to be placed in operation in the early 1960's.

The figures in mills-per-kilowatt-hour, as determined by American Standard, are shown in the accompanying table.

The table reflects the difference between U. S. and British construction costs—which run about 50% more in the United States. The table also reflects lower capital charges which are to be found in Britain.

The study estimates that the Calder Hall reactor would cost about $630 per kw to construct in the U. S. as compared with $345 for the pressurized water reactor.

Why Calder Hall Is Cheaper Than PWR Reactor

	Construction Costs in U. S.[1]		Construction Costs in England[2]	
	Calder Hall	PWR	Calder Hall	PWR
	(Mills per kwhr)		(Mills per kwhr)	
1. INVESTMENT CAPITAL				
Construction cost	12.8	7.4	4.8	2.8
Capital charges during construction	1.2	0.8	...	...
Start-up cost	0.1	0.1	...	...
Core	0.3	1.1	0.1	0.4
Total	14.4	9.4	4.9	3.2
2. PRODUCTION COSTS				
U-235 burnup cost	1.4	2.0	1.4	2.0
...less Plutonium credit	−1.4	−0.5	−1.4	−0.5
...equals Net burnup cost	0.0	1.5	0.0	1.5
Fuel rental	0.4	0.2	0.5	0.2
Fuel fabrication and processing	1.6	7.5	1.6	7.5
Total	2.0	9.2	2.1	9.2
3. SITE OPERATING COST	1.5	1.0	1.0	0.7
Total	1.5	1.0	1.0	0.7
GRAND TOTAL POWER COST	17.9	19.6	8.0	13.1

[1] Capital charges based on U. S. private utility accounting practices.
[2] Capital charges based on British Electricity Authority accounting practices.

Tornado Cripples 27 Mi of KCP&L Line

Utility reports it already has spent $120,000 for repairs, and may suffer a $300,000 gross loss

Kansas City Power & Light Co, having marshalled 200 men for its emergency crews, has started rebuilding and repairing damage wrought by the May 20 twister which buzzed through several communities in southeastern Kansas and western Missouri.

Latest damage rundown shows 27 mi of line out of service, of which 7 mi were 3 kv, 18 mi were 4 and 12 kv, and 2 mi were 161 kv.

Within 72 hr after the twister struck, 120 poles had been replaced on fringe areas of heaviest damage. Two-hundred more, serving heavily hit residential areas, probably won't be replaced until houses, schools, and business establishments are rebuilt.

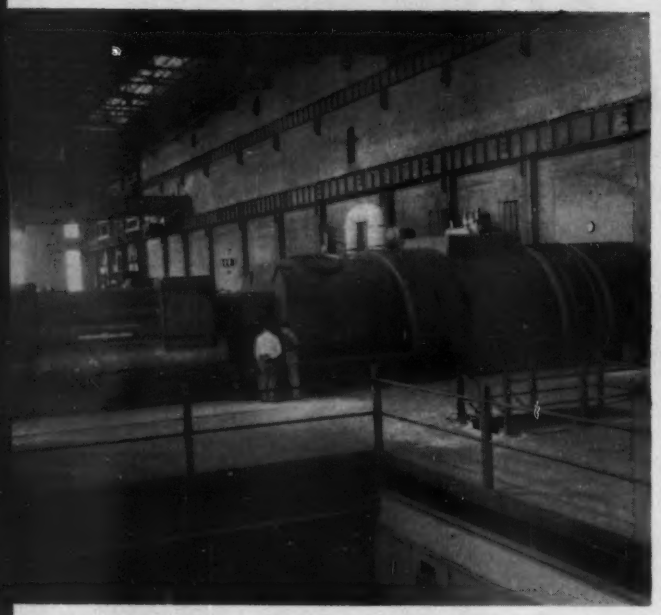
Three 70-ft-tall H-frame towers (carrying 161-kv lines) were toppled by the vicious winds. No substations were directly affected, but the company lost an unestimated number of transformers.

As of May 24, KCP&L had spent $120,000 in labor and materials on restoring service along the edge of the completely devastated area. KCP&L estimates its gross losses will not exceed $300,000.

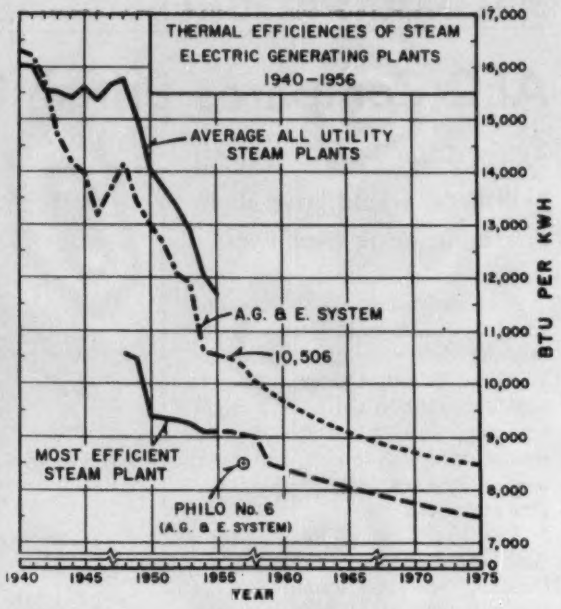
Meanwhile, utility damage estimate for the flood and tornado-plagued South Central area has been pegged unofficially at $20 million.

KCP&L foresees no capacity crisis this summer as a result of tornado damage to its system. Several hundred customers were lost because of the storm, and the load loss is expected to balance the anticipated load increase of air conditioning.

The tornado's ground speed was about 50 mph with core-wind speeds of 500 mph or more, the Weather Bureau estimates. The storm demolished nearly 500 houses, inflicting major damage to about 175, and minor damage to about 350.



Supercritical Unit at Philo Pioneers . . .



Marked Improvement in Btu/Kwhr as . . .

First 4,500-Psi Plant Is Unveiled

Ohio Power Co plant smashes critical-pressure barrier of steam generation to set record high in fuel economy

Steam plant operation in the supercritical pressure zone was demonstrated to the public for the first time at the recent press preview of Ohio Power Co's Philo No. 6 unit. Operation during this preview was at 4,100 psi, 1,025F with 63-Mw net output. Steam conditions will ultimately be boosted to 4,500 psi, 1,150F with reheats to 1,050F and 1,000F for 120-Mw net output at an expected heat rate of 8,530 Btu per kwhr.

This unit was erected in space vacated by a 30-yr-old 40-Mw unit. Total cost was $19.5 million. Gain in thermal efficiency will produce three times the kwhr for twice the coal consumption of the retired unit it replaces.

Successful operation of this supercritical unit marks "an achievement of American technology," said Pres Philip Sporn, American G&E Service Corp. Critical points in its design, he said, were the steam generator, the turbine, and the boiler feed pumps, all required to operate at pressures nearly double those of other high-pressure plants.

Because of the high pressures and temperatures, the Babcock & Wilcox steam generator contains more alloy steel than carbon steel. Its three Cyclone furnaces will burn 950 tons of coal per day at approximately 3,200F to flash 675,000 lb per hour of highly purified water into steam at 4,500 psi, 1,150F. It includes two reheat sections, the first designed to boost 1,225-psi steam from 800 to 1,050F and the second, 185-psi steam from 630 to 1,000F.

Special Design Required

The supercritical-pressure section of the turbine also required special design to function at the elevated steam pressure and temperature. The General Electric design uses chrome-moly-vanadium steel for the inner casing, shielded by a thin wall of austenitic steel against steam over 1,000F. Cooling steam is taken from the main line, desuperheated to 960F, and circulated between the austenitic wall and alloy casing. The whole assembly is cooled by its exhaust steam passing between the inner and the spherical outer casing enroute to the first reheater.

Rotors for this supercritical section are of two designs. The first is entirely of austenitic steel with 12%-chromium alloy buckets. The second is entirely of ferritic alloys with the first few stages steam-cooled to 1,025F.

Feedwater pumps are in two pairs, each driven by a double-ended, 4,000-hp induction motor. Constant-speed pumps, direct-connected to one end of each motor shaft, boost partially heated water from the deaerator and force it at 2,100 psi into two high-pressure heaters. Two variable-speed high-pressure pumps, driven through 3,000-hp fluid drives from the other end of each motor shaft, inject the feedwater at 5,450 psi, 525F into the steam generators.

Experience gained in the Philo design has already been applied in the 450-Mw, 3,500-psi units under construction at Breed and Sporn plants, said Sporn. And continued improvements will cut heat rates of coal-burning plants to 7,500 Btu per kwhr by 1975. Fuel economy of this magnitude is vital to expansion of industry capacity to the 460 million kw predicted for 1975, he said.

BOARD OF TRUSTEES discusses plans and aims of the new foundation. Members of the committee, from left to right, are F. S. Black, chairman; Edwin Vennard, board member; E. S. Lincoln, acting director; Julian K. Sprague, chairman of finance; Bern Dibner, treasurer; C. F. Wagner, board member, and Sam Hibben, secretary

Historical Foundation Created

- **Start is made toward inventorying and collecting electrical equipment and literature of historical significance**
- **Organizing committee may work toward establishment of a center to preserve items highlighting industry progress**

The first industry-wide effort to locate, list, and preserve the historical equipment and literature of the electrical industry has been launched with the founding of the Electrical Historical Foundation.

Stated purpose of the new Electrical Historical Foundation is "to locate, preserve, and encourage the public display of historical electrical equipment and printed matter to promote interest in electrical engineering and the electrical industry in the youth of America.

Aims of the new organization are:

- To locate and catalog all historical electrical equipment on exhibition and held in storage in museums, educational institutions, industrial plants, public utilities, and elsewhere.
- To acquire valuable equipment, particularly that in danger of being lost.
- To put such equipment in proper order for display purposes.
- To prepare for and put in storage equipment that will become historical in the near future.
- To receive historical electrical printed matter and to put such publications in proper order.
- To assist museums and other interests in the proper display of electrical equipment for greater public interests and educational purposes.
- To find a worthy home for equipment and publications in museums and libraries.
- To plan for museum space in areas where museums are not now available.

Indenture of trust, which serves the purpose of incorporation papers, was formally obtained last month following some ten months of organizing preliminaries. The foundation is now in business although its board of trustees is still to be formed.

Members of the organizing committee emphasize that the door is open for broad participation in the organization. They welcome the interest and aid of all men in the industry. Indeed, they plead for the coordination of industry efforts in the broad field which the Foundation hopes to serve.

Permanent organization of the Foundation is to consist of a Board of Trustees representative of the industry associations, electrical manufacturers, utilities, educational institutions, museums, and other similar interests having an interest in electrical industry progress. The board will be limited to 15 members.

First members of the board will hold office for a term of five years and will be designated by the organizing committee. Replacements will be selected by the board.

Project Creates Widespread Interest

Creation of the foundation is the result of a long-felt need and the driving force of such men as Lincoln who has been pushing the project for years, Dibner who founded the widely known Burndy Library which now contains a valuable collection of electrical literature, and Sprague whose family has played an important role in the manufacturing industry over many years.

Initial meeting of the organizing committee was held in New York in August of 1956. Members of the group were Fischer S. Black, publisher and editor of Electrical World; Bern Dibner, Burndy Corp; Julian K. Sprague, Sprague Electric Co; Tom Fort, Westinghouse Electric Corp; Edwin Vennard, Edison Electric Institute; E. S. Lincoln, historian and writer.

Black was designated chairman. Dibner was named finance chairman. Sprague prepared the charter.

Widespread interest was shown in an editorial published in the March 28, 1955, issue of Electrical World titled, "First an Inventory, Then a Museum." Manufacturers, museum officials, and others wrote letters indorsing the idea and several suggested sites for an electrical museum.

High Price of Sunshine

Lighting load lost for the April-September period of Daylight Saving Time will reduce gross revenue by about $100,000 for Wisconsin Public Service Corp. The company's rates and research department expects that a small amount may be recouped in the mornings.

Time switches on water heaters aren't being reset to compensate for the one-hour shift in time, the company reports.

French Eye Passamaquoddy

French manufacturers of hydro-mechanical equipment have their eyes fixed on the U. S.-Canadian Passamaquoddy Tidal Power Project as a possible market for a new axial-flow propeller turbine. In response to a query from the International Passamaquoddy Engineering Board, the company—Ets. Neyrpic—has dispatched an engineering representative to study the Passamaquoddy project for a possible application of the French machine. Neyrpic already is making a pilot unit for France's tidal power project on the Rance River estuary near St. Malo Harbor on the Brittany coast. Ultimate plans call for forty 11,000-kw turbines to be installed at the Rance site.

Sharpshooter Hits Buffalo

About 30,000 homes in Buffalo, N. Y., were blacked out from ten minutes to an hour one evening last fortnight. Police said the outage was caused by an unknown prankster who shot down a live wire in Gardenville. The bullet shattered an insulator, releasing a wire which set the pole on fire.

High-Cost Destruction

Missouri Power & Light Co paid $8,740 to build a smokestack for its Moberly, Mo., plant back in 1921. Now the stack has been put out of service. Cost of tearing it down ran $13,470.

11 Million Double-Duty Poles

Electric and communication utilities have used poles jointly since the late 1800's when both industries entered rapid growth stages. Today there are more than 11 million poles supporting both electric and telephone or telegraph lines. Over 8 million of these are in rural areas.

Central Maine Power Co tallied its joint use arrangements recently for 1956. CMP billed 48 companies for 93,115 attachments to its poles during the year. For the same period, the power company paid for 42,970 attachments.

New Skirmish in TVA Fight

Did Louis V. Sutton break a law while testifying before a government committee recently in behalf of the Chamber of Commerce of the United States? Rep Joe L. Evins (D-Tenn.) said the Carolina Power & Light Co president may have violated the Lobbying Act when he appeared before the House Public Works Committee in opposition to a self-financing plan for the Tennessee Valley Authority.

Evins suggested that appropriate committees of Congress recall Sutton for further examination to determine "whether proprieties or even laws have been violated."

The situation stems from Sutton's testimony in behalf of the U. S. C-of-C regarding a recommendation that TVA's electric power facilities be transferred to local, private, or public ownership under a ten-point program. (EW, May 20, p 81.)

Evins claims misrepresentation was involved in Sutton's claim that the U. S. Chamber of Commerce had adopted such a proposal officially. This brought quick, stinging response from the C-of-C:

"The Chamber has always opposed the public power features of TVA operations as the record clearly shows," said Richard W. Smith, manager of the Chamber's natural resources department. Clarence B. Miles, manager of the legislative department, added in a letter to Rep Evins:

"The specific suggestions offered by Mr Sutton as a 'ten-point program' to free the nation's taxpayers from the costly burden of subsidizing the TVA were developed by our Natural Resources Committee and approved by our Board of Directors in furtherance of these policies in strict conformance with the Chamber's authorized and long-established procedures.

"These constructive recommendations have long been well known to our membership and to Congress. They were first submitted to the Congress in testimony by Mr Sutton before the Senate Public Works Committee on July 22, 1955.

"Less than a dozen of the more than 2,700 chambers of commerce in our membership have told us of any objections to the 'ten-point program'."

Value Received with Accuracy

After 50 years and one day of service, a residential meter was retired by Public Service Co of Colorado. Metermen checked it out at a Denver service center and reported its accuracy to be within 6/10 of 1%. Original cost of the meter in 1907: $12.60.

Poll Spots Growing Support for Partnership

In contrast to mid-1956 survey, early 1957 poll shows more people favor partnership and cooperation rather than all public or all private

Only 2% of the voters in the Puget Sound-Cascade region of Washington state considered electric power to be an issue in last fall's general election, according to a survey conducted early this year for Puget Sound Power & Light Co of Seattle, Wash. A report of the survey has just been made available.

The survey is the second taken for the power company, an earlier one having been taken in mid-1956 by Elmo Roper & Associates. The second survey was conducted by Louis Harris, who had been in charge of the previous Roper study. Its results indicate that the following five major concerns dominated the last election among voters in the region:

1. The international situation.
2. The high cost of living.
3. Schools and education.
4. Labor problems.
5. The need for strong leadership in troubled times.

When asked specifically about "the so-called power controversy," the most frequent reply of those questioned was: "We have strong opinions on the subject, but we don't want electric power to be a political football."

Partnership Ratio Grows

The survey found that support for the philosophy of partnership and cooperation in the power field has grown substantially. In 1956, by nearly a 3-to-1 count, the people of the region preferred the concept of cooperation between private and public power to either alternative of all public or all private power. In the 1957 survey, the number who want cooperation increased to better than a 4-to-1 margin over either of the other alternatives.

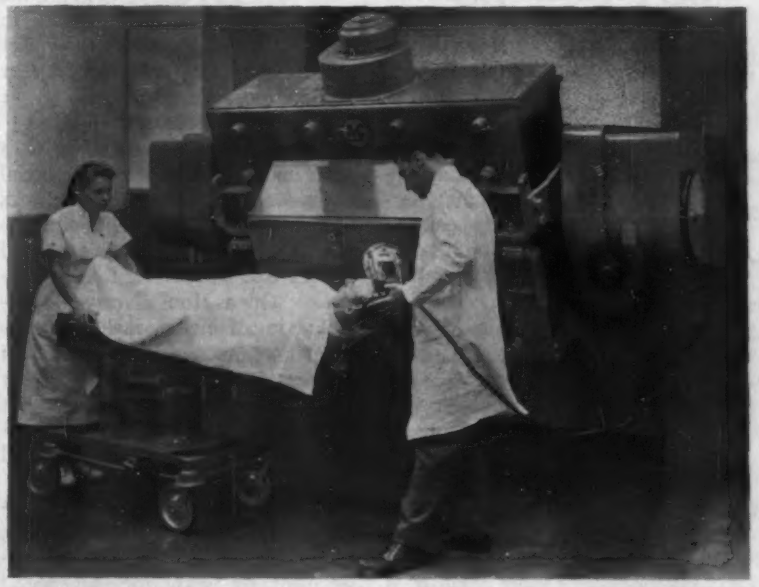
In 1956, by a 3-to-1 count, people preferred to see control of their electric utilities in the hand of local companies and agencies. In the new poll, the margin expressing a desire for local control grew to almost 5-to-1.

Rejected by more than a 2-to-1 ratio is the proposal that all the private utilities in the Pacific Northwest band together in a single company. Turned down by an even larger 3-to-1 margin is the idea that control of electric utilities be in the hands of the federal government.

The poll showed an increase in sentiment favoring the Puget Sound Utilities Council, in which Puget Power cooperates with four public utilities. In 1956, the margin favoring the Council was 15 to 1. In 1957, the margin has risen to 17 to 1.

"It is plainly evident that the new power philosophy among people in the Puget Sound-Cascade region—of cooperation for power and economic development, rooted in local control—has now reached overwhelming proportions," declared the report. "What appeared in 1956 as a change of major magnitude in public attitudes on power now seems to have become even more firmly set with time.

"The direction for the future, in the minds of the people, seems to be clearly toward increasing cooperation on the part of all of the electric utilities in the region. The people, on reflection, seem to be saying that they have tried the route of political controversy in the past, and this has not brought progress. Today, their mood is one of demanding that all who are concerned with the future of the region work together in common purpose. . . ."



Betatron Fights Cancer & Casting Flaws

The nation's first privately owned 24-million-volt Betatron is now ready to fight cancer by day at Madison (Wis.) Radiation Center, and—by night—examine industrial castings and forgings. Built by Allis-Chalmers Mfg Co, the $100,000 unit is fed by a conventional pole-mounted, three-phase transformer bank. But from the metering center in the building, power runs underground to an outdoor substation-type enclosure housing a special transformer bank and a bank of 9.6-kva step-voltage regulators. The third harmonic from an open delta is fed into a special tripper transformer bank to yield 180 cycles.

DATA SHEET AWARD, a $50 check, is presented to KG&E's C. B. Weeks, center, by subcommittee chairman H. M. Blackburn of PEPCO. Program chairman R. Layfield looks on

At EEI's 1957 Commercial Cooking Conference, Utilitymen told . . .

You Gotta Show 'em to Sell 'em!

Every potential electric commercial cooking customer in the country is "from Missouri". Before he'll buy electric equipment, he has to be shown what it will do for him.

That's the gist of what came out of EEI's 1957 Commercial Cooking Conference, held recently in Chicago. Time after time, successful restaurant and power company men got up and told the same story.

Sam Fine, owner of a string of hamburger restaurants in Toledo, Ohio, went to electric cooking because other types of equipment, particularly griddles, were causing trouble. Griddle tops, even his custom-made ones, warped and buckled until he went to electric. Now, all of his kitchens are electric.

Cost 'Least Important'

Restaurant owners shouldn't consider equipment cost alone, said A. T. Davis, owner of some 30 establishments in Georgia. ". . . In a sense, the price of cooking equipment is least important. Anything that gives my customers better food and my employees more comfort, is worth more than its cost . . . All these things played a part in my decision to open my first all-electric establishment."

Utilitymen find different ways to get their demonstrations and customers together, but all agree that commercial cooking equipment must be shown to be sold.

Potomac Edison Co has a special problem, according to John Coblentz, Commercial Cooking Supervisor. PECO has a big territory with few urban areas, hence, concentration of customers is low, and getting to them is tough. Solution: The company put its "Commercial Cooking Cruiser", a converted bus, filled with c.c. equipment, on the road. Results have been good. In the first three months, the cruiser added 135.6 kw, lined up another 1,362.2 possible kw; 40% of the possibles have been sold to date.

Southern California Edison Co's problem was different. Commercial customer density was greater in its service areas, so it brought them to "Open House" demonstrations, held in their district Electric Living Centers. "Open House" is well promoted in all media, including personal invitations, and cost to reach the customer is low—$3.28 per head. Program is still new, but SC Ed estimates that its slated 14 demonstrations in 1957 will add 7,000 kw and $210,000 EAR.

According to Indiana & Michigan's Electric Co's Ray Daugherty, "Nothing will take the place of direct contact with the prospect." I&MECO is faced with a situation similar to PECO's, that of sparse customer density. Daugherty's "Restaurant Idea Roundup No. 3" got around this by staging a series of mobile shows in the company's demonstration rooms in cooperation with Hotpoint. He added a novelty by calling on selected volunteers to prepare a light meal for those attending. This provided the sales clincher in many cases.

West Penn's John Rhea told about using the kitchen in his company's spanking new $5 million building at Cabin Hill, Pa. as a means of getting new customer interest. West Penn could do this because it is conveniently located to 80% of its commercial meters. Customers were invited to inspect the new headquarters at a dinner meeting at which they got the c. c. pitch.

Don't Overlook Schools

Don't be shy about pushing commercial cooking in schools said Metropolitan Edison's J. L. Beaver. School boards are not closed to the electric cooking story if it is presented properly and attendant benefits are stressed. Pennsylvania Electric Assn sponsored a survey among 11 major utilities in the state covering 98% of the commercial meters. Equipment costs were cited frequently as an objection by school boards, *but were overcome in 72% of the cases. Operating costs were not a major factor.* According to A. F. Southwick, of Consumers Power Co in Jackson, Mich., equipment performance rather than cost should be stressed when selling electric against other types.

EEI's Data Sheet Award went to Kansas Gas & Electric's C. B. Weeks for his sheet on the Mercy Hospital, Fort Scott, Kan., installation. Week's sheet was judged best of 12 publishable entries by Competitive Data Subcommittee of EEI's Commercial Cooking & Water Heating Committee.

SEE SPEAKERS included (left to right) Dr. W. W. Shoupp, Westinghouse Electric Corp; H. R. Wolf, Duke Power Co; F. G. Aandahl, Assistant Secretary of the Interior; and C. B. McManus, Southern Co. The conclave was at Miami Beach, Fla.

Warns SEE That Rate Structures Fail Too Fast

McManus urges Miami Beach meeting to protect earnings, investors; Shoupp cites road to economic nuclear power

Utility rate structures today become rapidly inadequate, C. B. McManus told the Southern Electric Exchange at its May 2-3 meeting at Miami Beach, Fla. The Southern Co's vice chairman attributed this rate deterioration to present interest rates and inflation. It's doubtful that the industry can keep ahead of inflation, he said, urging engineers and operators to examine rate structures with a view to helping the industry sustain earnings and protect investors. An adequate return and sound capitalization ratios, he declared, are essential to financing the industry's expansion.

Plant construction and operation are the only road to economic nuclear power, said Dr W. E. Shoupp, Westinghouse Electric Corp. Pressurized-water and homogeneous reactors, he said, seem the most probable approach to early economic nuclear power. But only a series of plants based on increasingly advanced ideas and simplifications can bring reactor system costs to the desirable level, he continued.

Computer analysis of a hurricane's course, is expected to increase the accuracy of radar-tracked course calculations, said Dr Gordon Dunn, chief of the Miami Weather Bureau, U. S. Weather Service. He invited utilities to send representatives to hurricane headquarters for briefing during hurricane threats. Such briefing, he said, would expedite protective measures.

Sees Hurricane Overdue

In reviewing hurricane forecasting, Dunn said that New England could expect a severe hurricane (100 to 129 mph) about once in 40 years; the North Carolina coast once in 10 years; Texas once in 5½ years; and Florida once every 3 years. On this basis, he pointed out, Florida is overdue.

Fred G. Aandahl, Assistant Secretary of the Interior, outlined the support functions assigned to utilities in the event of enemy attack.

Carolina Power & Light Co uses the temperature-control method for loading generators to maximum capability, said J. A. Jones and P. S. Colby. Cold-gas temperature is kept constant through changing reactive load by changing field current, changing kw load by changing the governor synchronizing device, or a combination of the foregoing.

Supercritical pressure and double reheat tend to become established for very large turbines, said J. E. Downs, General Electric Co. But steam conditions above 3,500 psig and 1,050F do not appear to be economically attractive now. Although a heat rate gain of 1.5 to 2% can be had by adding a second reheat at 1,050F, the greater equipment cost for 1,100F initial temperature would approximate 4.4 times the worth of the fuel savings, said Downs. Similarly, a gain from a shift to 4,500 psig appears inconsistent with the restrictions it would impose on the turbine designer.

Rewinding often reduces the temperature of old machines, said D. E. Stafford, National Electrical Coil Co. It reduces losses and the voids in slots and end windings, he said, adding that it also increases the air volume between end wind-

ings and provides the proper insulation thickness. All these factors, he said, reduce the temperature rise of the winding and the temperature gradient between copper and iron.

The arrangement of 115-kv bus selector switches at the new Allen Plant substation, near Charlotte, N. C., revolves around a hook-stick-operated disconnect switch, said J. Q. Wray, Duke Power Co. The switch has no insulator supports, and its blade is mounted on the aluminum cross bus. The blade, he said, swings in a vertical arc to connect with jaws bolted to the main aluminium bus 5½ ft above.

Switch Costs Cut

Use of the switch, according to Wray, cuts selector switch cost by 60%, and a lower overall cost reflects the switch's ease of application. Fewer bus supports, fittings, and connectors are needed.

Aluminum bus structural channel is to be preferred to tubular for high-current applications, said D. H. Sandell, Aluminum Co of America. Channel, he said, has the lower temperature rise. Aluminum tubular bus, said Sandell, comes into its own in corrosive atmospheres. It is excellent for high-voltage applications and reduces corona and radio influence. Generally vibration in rigid buses causes only small stresses and can be reduced by stringing cable inside the bus or by applying Stockbridge dampers.

Describes R/W Clearing

Savings in supporting structures have been effected by supporting rigid buses by suspension insulators, Sandell continued. Such support has been used for tubing structural angles, structural channels, and integral web-channel bus. When swinging, these buses absorb peak energy from short-circuit forces, he said.

Lousiana Power & Light Co holds that all transmission rights-of-way should be cleared annually, according to H. B. Balfour and J. H. Thatcher Jr. Trees and brush are cut to ground level in the original clearing, and the ground leveled by dragging heavy beams over it. Mechanical mowing is on a yearly basis thereafter.

A 14-man crew, including ten tractor drivers, maintains 1,100 miles of the right-of-way. There are 800 miles of 115-kv and 300 miles of 34-kv lines. The average cost of maintenance clearing is $8 per acre, the cost of original clearing being about $111 per acre.

Florida Power & Light Co, according to R. C. Webb, controls the effects of high-tension insulator contamination by:

- Over-insulating to give 2 to 3 in. of leakage distance per kv and bonding exposed hardware to ground.
- Replacing contaminated insulators with clean ones.
- Use of a coating (commercial floor wax) to increase the surface tension on insulators.
- Periodic washing with water at 300 to 500 psi.

Urges Simple Designs

Fault currents on the system are growing along with power systems and generating station interconnections, said J. W. Skooglund, Westinghouse Electric Corp. Thus ground-fault duty may exceed the capability of breakers subjected to duty approaching their maximum rating for 3-phase faults, he said, arguing for reducing ground-fault current to a value equal to or slightly less than that of 3 phase. Probably the easiest way of doing this, he said, would be to use selective ungrounding of about half the generating station transformers.

Increasing labor costs demand simple designs that hold construction costs to a minimum, said A. H. Thiermann, Virginia Electric & Power Co. His company's recently revised substation grounding specifications, he said, permit field forces to install an adequate yet economical grounding system without an engineer's supervision.

R. Bry, General Electric Co, compared the first costs of load-tap changing transformers and regulators. Most expensive, he said, are single-phase regulators (100%); next, 3-phase regulators (71%); third, LTC equipment (67%); and finally pole-type regulators (49%).

Scholarships and cooperation between utilities and schools would help reduce the present shortage of engineers, said F. R. Rauch, Cincinnati Gas & Electric Co. He recommended that recipients be required to work for a specified period for utilities sponsoring scholarships.

E. E. McIlveen, Okonite Co, described an ionization tester for inspecting cable inch by inch on a production line. The tester sends a signal through the insulation, and molecules in the voids reflect the signal to the tester.

Fly ash could sell at a price equal to that of the original coal, said H. H. Russell, Bituminous Coal Research, Inc. To do so, it should have a low carbon content which utilities can obtain by adjusting burning performance. Such adjustment would also give the user the usable heat in the unburned carbon which otherwise goes up the stack.

Cites Cable Use

By going to automatic steam regulation, savings are expected to pay off Southern Co's $300,000 investment in automatic control equipment in the "Early Bird" in less than two years, said Grady L. Smith, Southern Services, Inc.

Silicon bronze as the tube sheet is attractive for its tensile strength in welding condenser tubes and tube sheets, said L. H. Hawthorne, Revere Copper & Brass, Inc. Moreover, torch adjustment is simpler, weld contour better, and welding speeds higher.

Primary and secondary aerial cable, with underground transformer vaults, could serve medium-density business areas, said R. H. Stevens, Florida Power & Light Co. Cost and reliability considerations point to a loop or throwover system, or a combination of the two, he said, noting that such a system would have a practical limitation of about 600 kva per block of uniformly distributed load.

Urges NEC Provision

Three-element relays are needed to prevent 3-phase motors in air conditioners, refrigerators, etc., from single-phasing, said F. E. Johnson, Jr, New Orleans Public Service, Inc. He urged utility company action to have the National Electrical Code make such provision mandatory.

Phase-to-neutral fault currents usually are limited by Carolina Power & Light Co to 3,500 amp at the substation bus supply 12.47 or 23-kv distribution circuits, said N. H. Erlandson. The currents are limited by neutral reactors. But split bus is used also.

RMEL ENGINEERING COMMITTEE included (l to r) J. E. O'Connell, Babcock & Wilcox Co; Dr. L. M. Robertson, PS of Colorado, and J. Parce, Stearns Roger Mfg Co

Told High-Altitude Line Costs

RMEL at Denver hears EHV transmission at 12,000 ft will run to $50,000/mile; Leadville will make design tests

Preliminary estimates are that EHV lines through 12,000-ft mountain passes to the Denver area will cost $50,000 per mile, the Rocky Mountain Electrical League was told at its annual spring conference April 22-23 at Denver, Colo.

Tests at the 500-kv, high-altitude, corona test station at Leadville will supply the optimum design data for such lines, said L. M. Robertson, Public Service Co of Colorado.

Serves Short Laterals

A single-phase "distributor" circuit underbuilt on sections of a 7.6/13.2-kv distribution system serves many short laterals, said J. R. Hayden, J. E. Martin, and R. L. Tilson, PS Co of Colorado. The laterals, they said, are protected by sectionalizers, the "distributors" by reclosers, and the primaries by 3-phase reclosures with ground tripping and extra-heavy-duty cutouts.

Fuel vaporization is improved greatly by irradiating combustion air with radio-active materials, said R. McBrian, Rio Grande Railroad, who cited recent diesel-electric locomotive fuel tests. Even the cheapest fuel oil grades seem to burn economically under such treatment, McBrian said. He predicted the use of low-grade Western coals as diesel fuel.

An increasing number of utilities are investing in collectors to reduce stack effluent at steam stations, reported E. R. Johnson, Western Precipitation Corp. The trend, he said, is toward combinations of washers, cyclones, and electrical precipitators.

Near Coal Supply

Dave Johnston steam station is the first of many thermal stations in the central intermountain region, said E. L. Bayles, Pacific Power & Light Co. Built near Glen Rock, Wyo., adjacent to coal supplies that can be strip mined, the plant will have a 100-Mw tandem-compound turbine taking 1,450 psi, 1,000F, reheat steam, he said.

J. K. Howell, Westinghouse Electric Corp, urged study of derating induction motors and of the use of protection in all phases where unbalanced voltages cannot be corrected.

In such phases, consequent current unbalance can cause excessive temperature rise and other undesirable effects, he added.

Aluminum Bus Popular

Many varieties of voltage-current compensated and kvar controls are among manufacturers' recent developments in metering devices, said W. J. Thacker, Sangamo Electric Co.

D. H. Sandell, Aluminum Co of America, attributed the growing popularity of aluminum bus conductors to its ease of erection.

Seattle May Join PUD in Owning Power Facilities

Seattle, Wash., City Light may join with a Public Utility District in owning and operating electric power facilities, under a bill passed by the recent session of the state legislature and enacted into law by the signature of Gov. Albert D. Rosellini.

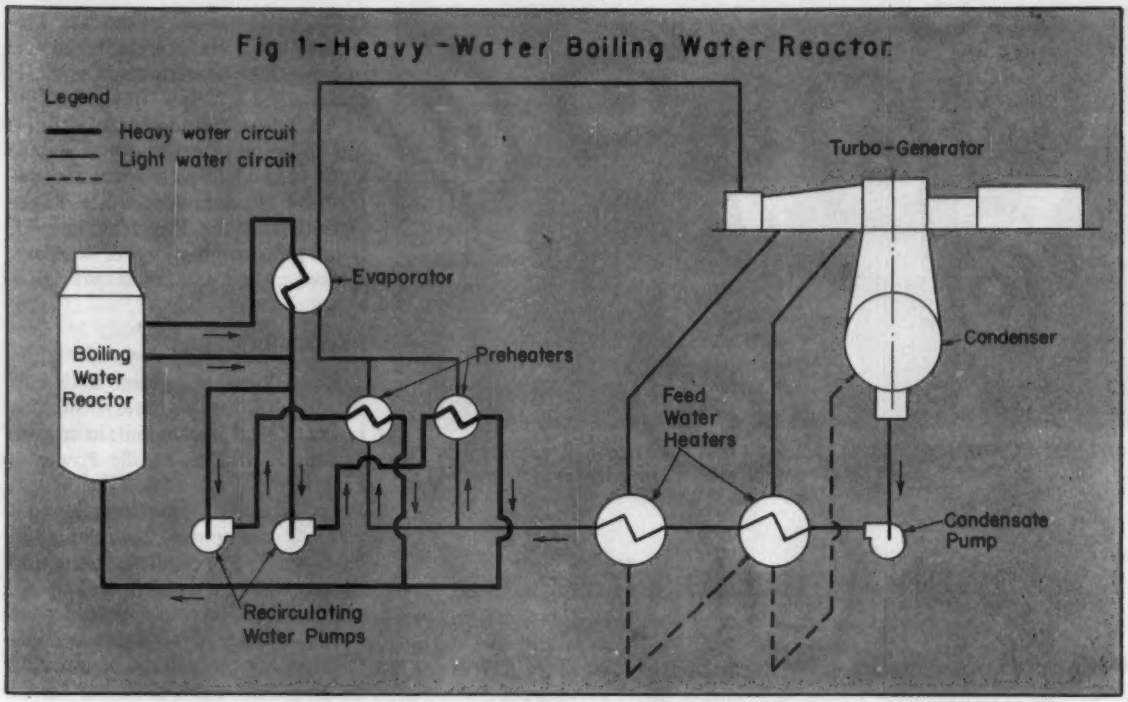
The bill applies to any city with a population of more than 150,000 in the state, but Seattle is the only city which clearly would qualify.

It could be helpful to Seattle in construction of its proposed boundary Dam on the Pend Oreille River, a project in which the Pend Oreille PUD also is interested.

Carolina Aluminum to Start $13-Million Hydro Project

The Duke Power Co and the Carolina Power & Light Co are affected by recent action of Federal Power Commission in granting Carolina Aluminum Co of Badin, N. C., permission to carry out a proposed new $13.8-million Tuckertown hydroelectric development on the Yadkin River, eight miles north of Badin. The project includes one new development and three existing plants on the river.

Power generated by the existing dams is used by the Carolina Aluminum Co at its Badin smelting works. The company has an interconnection with the systems of the Duke Power and CP&L, by which peak load energy is furnished them. Carolina Aluminum said future operations of the project would be essentially the same under the new project.



Design study of nuclear cycle shows that . . . .

Heavy-Water Reactor Has Promise

Estimated total power cost of boiling-water reactor using D_2O as coolant and moderator is 13.1 mills per kwhr for 60-Mw plant and 15.4 mills for a 40-Mw nuclear unit

F. W. McCLOSKA, Partner, Sargent & Lundy, Consulting Engineers, Chicago, Illinois

Design studies indicate that estimated costs of power produced by a 60-Mw heavy-water, boiling-water reactor are 13.1 mills per kwhr. Sargent & Lundy made this estimate by applying proved information on atomic power and reasonably certain but as yet unproved information. The study was prepared for a 152-Mw (thermal) reactor and a 40-Mw/60-Mw steam-driven turbine-generator unit. It indicated capital costs of $301 and $226 per installed Kw for the 40 and 60-Mw plants, respectively.

Two designs were developed for the conventional part of the plant. One uses a saturated steam cycle; the other is identical with the first except for the addition of a separately-fired steam superheater which permits the installation of a 60-Mw turbine-generator unit.

The reactor design was the result of studies of all reactors under consideration and their particular problems. It is a high-pressure, heavy - water, forced - circulation, boiling reactor because of the advanced technology of solid fuel element reactors. The fuel is uranium enriched slightly with U^{235}. Mixed with it is the fertile material thorium, also as an oxide. The containment vessel encloses only the reactor and associated equipment and is designed for relatively high pressure and small free volume.

Heavy water (D_2O) was selected as the moderator, reflector, and coolant because of its favorable nuclear characteristics. Although the possibility of producing power from large D_2O reactors at lower cost than from H_2O reactors is generally accepted, the larger capital investment required, together with the risk of D_2O loss during operation, has deterred D_2O technology. The recent reduction in price of D_2O encourages its use.

Large, uranium-thorium, D_2O reactors assure a conversion ratio in excess of unity. This should permit fuel burnup in the order of 10,000 Mw-day per ton without excessive U^{235} enrichment. Existing reactors permit burnup in the order of 1,000 Mw-day per ton, and it is expected that the solid-fuel reactors going into operation soon will have burnup in the order of 3,000 Mw day per ton. When the 10,000 Mw day per ton is realized, it will be a major step toward competitive nuclear power.

Advantages foreseen in oxide fuel are that the potentially violent chemical reaction between uranium or thorium and water will not occur, essentially eliminating radiation-damage limitations to fuel

burnup. Economies in fuel fabrication also appear possible. The design uses a boiling reactor operated at high pressure with forced circulation of subcooled water to obtain maximum power from the core size. Such high specific power minimizes the reactor investment cost per unit of power output.

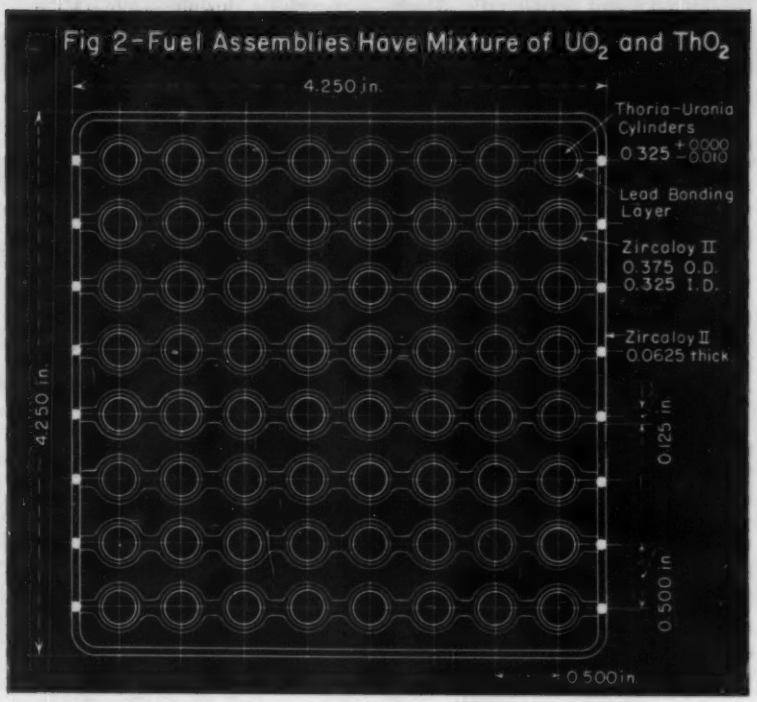
The coolant will be allowed to boil in the core, and the steam generated will be condensed in the tube side of an evaporator. This process was selected because of the excessive investment for heavy water when a direct cycle is employed. The circulated primary coolant with the D_2O steam condensate will be subcooled to 40F below the saturation temperature in a preheater. Approximately 44% of the heat needed to form the required amount of saturated steam at 870 psig will be extracted in the preheater, 56% in the evaporator.

Indirect Cycle Has Advantages

The indirect cycle has other advantages. Reactor response to load changes has, to some degree, the automatic characteristics of a pressurized non-boiling system. Possible radioactive contamination of the turbine and associated equipment is eliminated, and the necessary equipment in the containment vessel reduced.

The pressure vessel, which will contain the reactor core, is 9 ft ID and 33 ft high, designed for a pressure of 1,500 psig. Fuel loading ports are in the top. There will be two openings in the sides of the pressure vessel, one for steam removal and one for forced circulation exit lines. Control rod extension shafts will pass through thimbles in the bottom of the vessel and holes in the steel shield.

A mixture of slightly enriched uranium (UO_2) and thorium, (ThO_2) is incorporated in the design of the fuel assemblies which are to be 4.25 in. square and about 10 ft long. The UO_2-ThO_2 mixture will be fabricated into cylindrical elements which will be incorporated in Zircaloy II plates. The high degree of fuel subdivision allows high specific power without excessive internal fuel temperatures or heat fluxes. Lead as the heat transfer bond between the oxide rods and the Zircaloy clad will eliminate the need for close tolerances in fabrication.



FUEL AND BLANKET assemblies will be held in place by grid support plates as shown in the typical core above. Orifices will assure proper coolant flow rates

There will be 96 fuel assemblies in a fuel core loading, and 40 blanket assemblies in the reflector. Fuel and blanket assemblies will be supported in place by grid support plates. The bottom end of the fuel assemblies will fit into sockets in the plenum plate. Orifices in and between each socket will assure satisfactory coolant flow rates through and around individual assemblies in the core. The control rods will pass through the plenum plate which will act also as a support for control rod guide bearings.

Initial conversion ratio in the core alone is expected to be about 0.74 and, including the blanket, should be approximately 0.92. With the U^{235} replaced by U^{233} (converted from the fertile thorium) on succeeding loadings, the initial total conversion ratio becomes about 1.08. The accumulated fission products during fuel irradiation are not expected to reduce the average conversion to less than unity. The use of oxide fuel and a soft lead bonding layer between fuel and cladding, capable of absorbing dimensional changes in the fuel, is expected to result in burnups of the order of 10,000 Mw day per ton before removal of fuel elements for reprocessing. Spent fuel assemblies will be transferred in a lead-shielded coffin to a water-filled storage well where they will cool for approximately three months before shipment to a chemical plant.

Reactor power output will be automatically controlled by a steam by-pass system at the turbine which will maintain constant steam pressure to the turbine. The steam by-passing the turbine will heat the feed water in the secondary system. An increase in turbine steam demand will decrease the feed water heating and thereby subcooling in the primary system which, in turn, will raise the reactor power. A decrease in steam demand at the turbine will have the opposite effect. The regulating control rod will assist in control.

In the unlikely event that all of the coolant is lost from the reactor vessel, the core will be cooled by spraying it with heavy water from a ring within the reactor vessel. This will prevent melting of fuel elements.

Ports for fuel element loading and unloading will be located on the reactor vessel top directly above the

reactor core and peripherally. Each port will allow access to 6 to 12 assemblies.

A lead-lined coffin will transfer radioactive assemblies from the pressure vessel to a storage well. Assemblies will be selected for removal with an indexing device. They will be cooled during transit and deposited in a light-water storage well. Although this fuel handling operation is more time consuming than an automatic system might be, the initial investment is considerably lower, and reloading is scheduled for only once every six months.

The value of heavy water requires careful treatment and maximum recovery of both contaminated and dissociated heavy water. A heavy water purification system will remove suspended matter and dissolved solids resulting from corrosion or erosion, or fuel assembly rupture. It will also remove light water that may enter the main heavy-water system from exposure to the atmosphere during reactor loading or unloading.

During operation, coolant will be bled continuously from the reactor circulating system into a demineralizing system to remove ionic impurities. It will then be returned to the primary coolant circulating system. There will be three parallel lines, one for normal operation and two for emergency purification and changeover.

To remove light water from the coolant, the heavy water is pumped from the heavy-water storage tank to an isotopic distillation unit. The effluents are pure heavy water which is returned to the storage tank, and heavy water containing approximately 20% light water.

The heavy-water recombination system will recombine D_2 and O_2 which result from the disassociation of heavy water caused by the intensive radiation in the reactor. The system will also vent any non-condensable gases that may be present in the heavy-water coolant.

The D_2, O_2, non-condensable gases, and some heavy-water vapor will be continuously bled from the condensate outlet of the evaporator and throttled to a low-pressure system consisting of a primary condenser, a D_2-O_2 recombiner, and a secondary condenser. The primary condenser will recover the bulk of the D_2O vapor in the off gas steam. The condensed D_2O will flow to the heavy-water storage tank.

Gases from the primary condenser will pass through the platinum catalyst recombiner in which the D_2 and O_2 will be combined to form D_2O. This is subsequently condensed in the secondary condenser. The condensate will be separated from the non-condensable gases in a cyclonic-type separator from which it will flow to the D_2O storage tank. Non-condensable gases will be vented through a refrigerated system to the atmosphere.

Containment Vessel Used

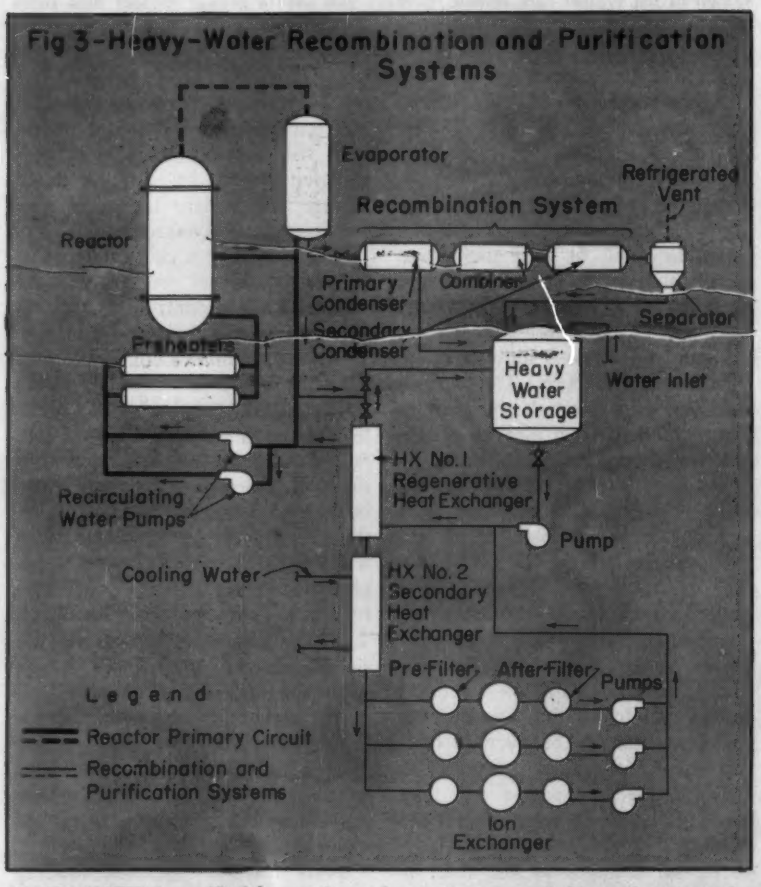
Adjacent population centers will be protected against possible radioactive fallout by a containment vessel, designed to prevent escape of gases or vapors containing radioactive fission products which may be released in a nuclear accident.

Liquid radioactive wastes will collect in a waste drain tank. They will be filtered and transferred either to the heavy-water storage tank or to a production plant, depending upon the degree of light-water contamination.

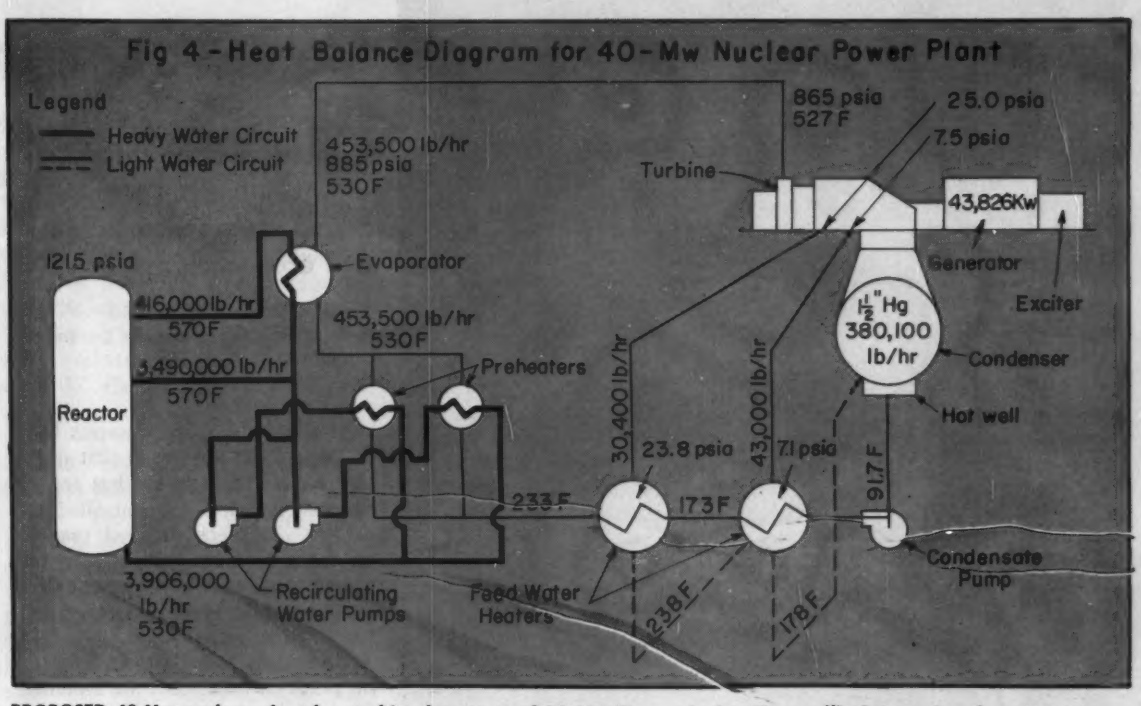
Wastes from equipment decontamination operations will be collected in another waste tank. Low-activity wastes will be transferred to a temporary storage tank. High-activity wastes will be concentrated in an evaporator and transferred to a permanent underground waste storage tank on the site.

The condensate, low-activity water will be transferred to the temporary storage tank. The radioactivity of the low-activity wastes in temporary storage will be allowed to decay to a tolerable level and will be discarded at metered rate. Radioactive waste solids will be baled into bundles and stored in the permanent burial ground.

So that conventional power generating features may conform more nearly to industry standards, the cycle will use a turbine genera-



HEAVY WATER is purified by continuously treating part of this coolant in a demineralizing system. Recombination facilities for the D_2O are also proposed



PROPOSED 40-Mw nuclear plant has turbine heat rate of 10,000 Btu per kwhr. The auxiliaries require about 2.2 Mw

tor designed for operation with throttle steam conditions of 850 psig and exhausting at 1½ in. Hg absolute. An indirect steam cycle was selected to minimize heavy-water requirements. This will also reduce provisions for heavy-water recovery in the steam plant. The arrangement will also eliminate shielding and containment of the generating equipment.

Predicted heat rate for the 40-Mw plant is approximately 10,300 Btu per kwhr generated. The 60-Mw plant, with separately fired superheater, will have a heat rate of 10,810 Btu per kwhr.

Steam generating equipment will consist of two feed-water preheaters, two controlled circulation pumps, and a feed-water evaporator. Because the steam to be condensed in the feed-water evaporator and the heavy water to be sub-cooled in the feed-water preheater will be irradiated in the reactor, these units and the controlled circulation pumps will be in the containment vessel. The two feed-water preheaters will be closed heat exchangers with the feed water on the shell side and heavy water on the tube side.

The feed-water evaporator will condense the steam generated in the reactor and vaporize the feed water for use in the turbine. A moisture eliminator of conventional design will be placed in the evaporator.

Superheater Can Be Used

The turbine generator for the saturated cycle will be rated at 40,000 kw, 850 psig saturated, 1½ in. Hg absolute, with provisions for extracting steam from two stages for feed water heating. Moisture-elimination equipment will maintain the quality of the steam. A separately fired superheater and its auxiliaries will raise the throttle steam temperature from 527 to 900F and allow an increase in the turbine output to about 60,000 kw.

For the superheated cycle, the turbine generator will be rated at 60,000 kw, 850 psig, 900F, 1½ in. Hg absolute with extraction provisions for two feed-water heaters.

Estimated total capital cost for the 40-Mw plant is $12,033,000; for the 60-Mw plant $13,577,000 with the reactor portion in both cases $7,085,000. This indicates an investment of $301 and $226 per kw for the 40 and 60-Mw plants.

Assuming that a burnup of 10,000 Mw day per ton is possible, the estimated annual nuclear fuel cost is $1,299,000. It was estimated that plant personnel would be 40 without and 50 with a superheater, that the superheater efficiency is 65%, and the heavy-water loss 5% per year. On these assumptions, power costs including fixed charges are estimated to be 15.4 and 13.1 mills per kwhr, respectively.

Much has been written about the possibility of larger plants having lower costs per unit of heat output and possibly being competitive with conventional plants. Such a study was made for a medium-sized private utility. In it the unit size was fixed at 125,000 kw, annual load factor 75%, and the cost of coal 30¢ per 10^6 Btu. A pulverized-coal plant, a total nuclear plant, and a combination nuclear and superheater plant with a 73 Mw / 52 Mw split between the reactor and superheater were considered in this design study.

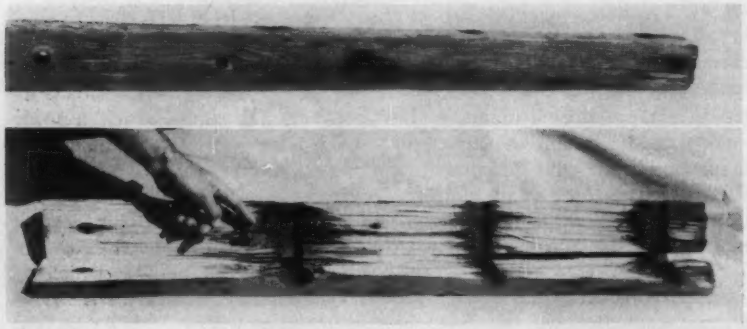
The study indicated that fuel costs are roughly the same for the three schemes. Operating costs run about a third more for nuclear plants because of the additional personnel for operation and security. Fixed charges are about 75% greater for the higher investment. The net result is that nuclear power costs are estimated as 43% greater than conventional plant costs for the conditions studied.

Can Crossarm

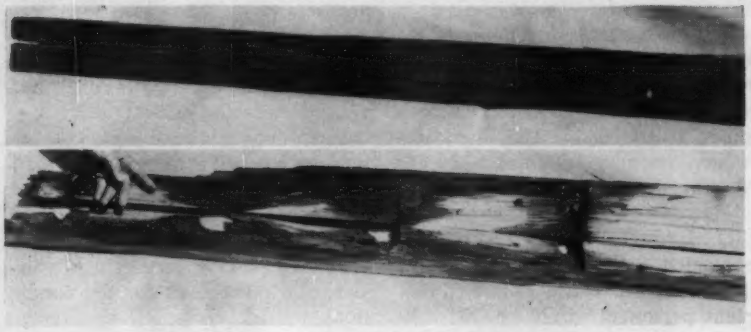
Treated and untreated fir arms are under Detroit Edison observation to find economical solution

R. S. STOKER, Detroit Edison Co, Detroit, Mich.

EXPERIMENTAL CROSSARMS, treated in different ways, have been installed in controlled locations where observers can record data on average life expectancy



ROTTED CROSSARMS do not reveal inner decay to inspection. Split sections show how deterioration attacks areas at ends and around pin holes and bolt holes



How long should crossarms last?

To find the answer to that question Detroit Edison Co has set up experimental lots in controlled locations. It keeps detailed records on these crossarms which are expected to provide performance data on the various types of treated and untreated fir arms.

Crossarms that last as long as the poles on which they are mounted form an ideal structure for the operating man and the cost accountant. There would be no interim replacements; no crossarm failures in service. But then all poles do not decay at the same rate. Neither do crossarms. Poles given today's preservative treatment are expected to last 40 or more years. Untreated poles average a life expectancy of somewhat more than 20 years.

Statistics Meager

In general, the vital statistics on crossarms are rather meager. Detroit Edison's data are expected to fill this need eventually. Meanwhile, utilities must rely for their estimates of average age on the opinions of field groups or their own experience with crossarm replacements on specific lines.

Estimated average life of untreated Douglas fir crossarms is about 20 years. When such crossarms are installed on 40-year poles, expensive crossarm replacements result. Moreover, crossarm deterioration is a hazard, and, inspection difficult. Inspection does not reveal decay that is almost wholly internal. Determining the presence of decay is costly.

In an untreated fir arm expected to last 20 years decay develops in the exposed end grain of pin holes, bolt holes, and the end of the arm. As these zones are readily treated

Match Pole Life? Answer Sought

with preservative, extension of the natural life is rather simple. But an untreated Southern pine crossarm has a life expectancy much shorter than untreated fir, although it can be treated to extend its natural life considerably. The problem then arises as to just what extent crossarm life should be increased. Here are some pertinent questions and some answers:

Should crossarm life be extended to equal that of poles?

Life expectancy of untreated Northern white cedar poles averages 20 years. But so great is the variation from the average that at the end of 10 years 10% may have been replaced because of decay although 13% may still remain usable after 30 years. Accordingly, the practicability of matching crossarms with poles appears remote.

Can arms and poles of comparable life be matched and installed together?

Odds are even that a short-life crossarm will be installed with a long-life pole, or that a short-life pole will be installed with a long-life crossarm. Thus many utilities have found reason for replacing untreated fir crossarms installed on untreated Northern white cedar poles.

Even though their life averages are equal, the matching of individual members is poor, and no available information can guide a reasonable job of matching.

When a treated pole's expected life is 40 years, how much should crossarm life be extended?

Statistics indicate that to avoid crossarm replacement during the life of the pole, anticipated crossarm life should be about twice the anticipated pole life. Although information is not sufficient for determining just how long a particular preservative treatment protects crossarms, a crossarm life greater than that of today's poles is undoubtedly obtainable. Consequently. arm replacements are reducible.

Long crossarm life, however, must be weighed against initial cost. This is the area in which the paucity if service data is relatively unimportant. The cost of the high-quality preservative treatment is insignificant compared to the crossarm replacement cost, even over a long period. Total treating cost may be about 15% of the crossarm cost. Replacement is likely to cost about three times what the material cost.

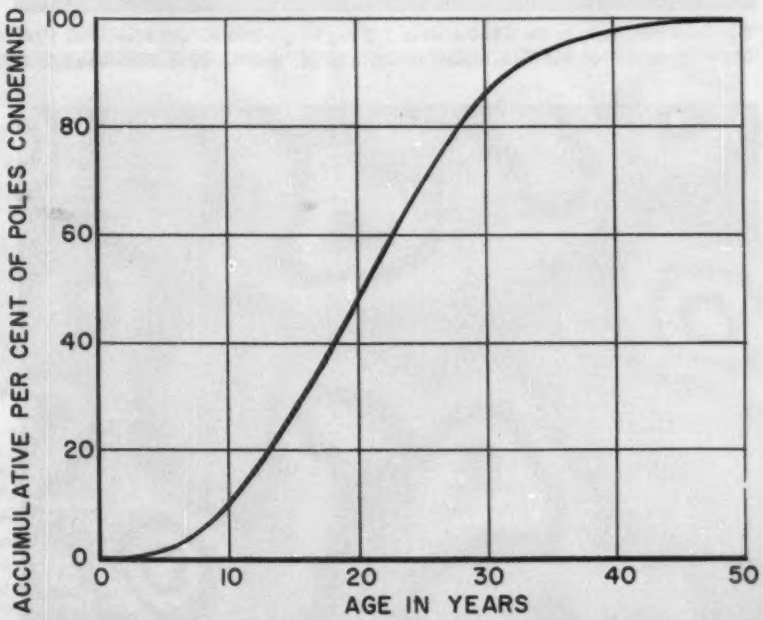
A long-life treatment means that adequate preservative has been properly distributed in the wood. Such treatment is satisfactory when the product is clean. Crossarms with good penetration and a maximum retention of preservative consistent with clean surfaces are desirable. The difference in cost between good and poor treatment is insignificant, and handling costs vary little. Any major difference in cost lies in the quantity of preservative and the treating time.

Cuts Replacements

Detroit Edison has used crossarms, treated according to EEI Specifications TD90 (fir) and TD91 (pine), with good results since 1946. On Douglas fir crossarms a retention of 6 lb per cu ft of a solution of 5% pentachlorophenol is required, along with an end-grain penetration of 1½-in. On Southern yellow pine, an 8-lb retention of either creosote or pentachlorophenol is required. Sapwood penetration must be complete.

Although the life thus afforded cannot be predicted, it is expected to be long enough to minimize crossarm replacements. Many poles will not remain in place for their full natural life, yet more than half will be standing at the average natural age. Longlife crossarms on the surviving poles will be certainly worthwhile. The removal of crossarms on poles prematurely replaced represents a negligible loss, as initial cost of treatment was small. Actually the value of such arms for possible reuse may more than compensate for this loss.

Incomplete information on crossarm life complicates the problem, but the large return at small cost and the opportunity to reduce future maintenance and insure maximum safety and service reliability call for serious attention.



VITAL DATA on Northern white cedar poles contains wide variations. Average life is 20 years, yet 10% rot in 10 years and 13% survive at end of 30 years

Hot Line Maintenance Program

Practices initiated in the 30's enable PP&L to develop with 12 kv the best possible service continuity to customers

W. Z. LUDORF, Lines & Substations Dept, Pennsylvania Power & Light Co, Hazleton, Pa.

Hot line maintenance on Pennsylvania Power & Light Co circuits is commonplace as the result of a coordinated operations, training, and tool provision program. Starting in the 1930s on 7.2-kv single phase, hot line work was extended in the 1940s to 12,470-v, 3-phase circuits. A major objective, best possible continuity of service to customers, has been realized.

The development of safe and efficient work methods was started on a single-phase, 7.2-kv line, proceeding in the order: single-phase tap, double deadend, side tension, and full side tension. This was followed by 3-phase, 12-kv line work in the order; vertical tap, double-dead-end angle, buck-arm tap, buck arm, full-tension three-way, side tension, and full side tension.

A hot line tool committee, consisting of representatives from the safety, engineering, and lines and substations departments set up three main objectives: (1) standardization of tools, (2) establishment of uniform and safe work methods, and (3) revision of design specifications for complete adaptation to hot line tool maintenance.

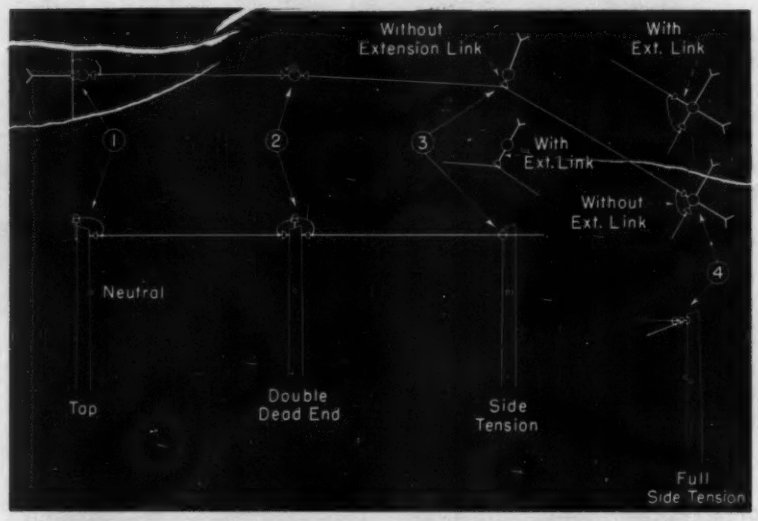


FIG 1—LINES built in the 1930's were 7.2 kv, single-phase. On such lines PP&L began program of hot line maintenance, extending it to lines developed later

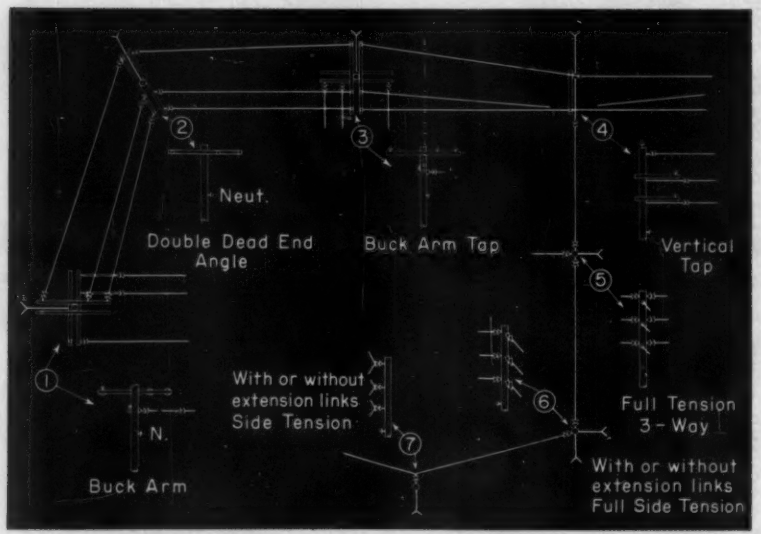


FIG 2—HOT LINE TRAINING went to the 12-kv lines which came into use in the 1940's. What was learned at lower voltage, was applied and extended on these

Pictures Obtained

To attain these objectives and develop methods to handle 12-kv tension construction, single-phase 7.2-kv and 3-phase, 12-kv training lines were built (Figs 1 and 2). Samples of every type of hot line tool in use on the system were studied and applied to these training lines. Additional tools designed for tension work were purchased.

Coordinated services of a five-man line crew, a safety instructor, and a photographer resulted in pictures and colored movies.

Questions Resolved

Experimental work resolved these questions: (1) Is the method safe? (2) Is there an easier and more efficient way? (3) Is the tool being used for each step the one best for the purpose? (4) Can the tool be modified for easier handling and operation? (5) Can a new tool be devised to meet difficult situations? (6) Does the type of construction lend itself to safe and efficient hot line tool maintenance? (7) Does the line hardware as specified offer difficulties in handling with hot line tools?

Suggestions were made to manufacturers for changes in design of certain tools to make them more efficient and easier to handle.

Design specifications of structures were revised from viewpoints of safety, practicality for maintaining with hot line tools, and cost. Buck-

Boosts 12-Kv Service Continuity

arm tap construction was replaced by the 3-phase vertical tap; double-dead-end angle and buck-arm poles by either 3-phase, vertical side tension or full side tension construction.

New line hardware for 12 kv was adopted to solve operational problems in handling with hot line tools (6-in. disc insulators replaced the 7½ in.; the straight-line clamp, the snubbing-type strain type; and the spring-type cotter key, the plain type).

A manual was projected. Photographs of each major step in the procedure on each pole and a colored movie were taken of the entire job for each structure for use in later training.

With data thus gathered and supplemented by safety and operating observations, preparation of the manual was started. A standard name and reference number were assigned to each hot line tool and accessory. Examples are: All Purpose Grip Stock (2), Cotter Key Tool (15), Full Tension Disc Insulator Shield (24), Snubbing Device (45). The manual includes:

What Manual Presents

1. Index.
2. Brief treatise on the care and inspection of tools.
3. List of safety and operating pointers on basic everyday use to make working with hot line tools safer and easier.
4. Complete descriptions and illustrations for each type of construction, including (a) a photograph and listing of all tools for the job, (b) the step-by-step procedure, and (c) photographs of actual arrangement of tools for each major step.
5. Approved list of hot line tools.

With the manual complete and color movies to show actual applications, six two-week training schools were set up for 160 men. These were assigned in working groups of four line foremen, four first-class linemen, and an instructor. The daily schedule for each group covered every type of construction during the two-week period. Each man was given a manual.

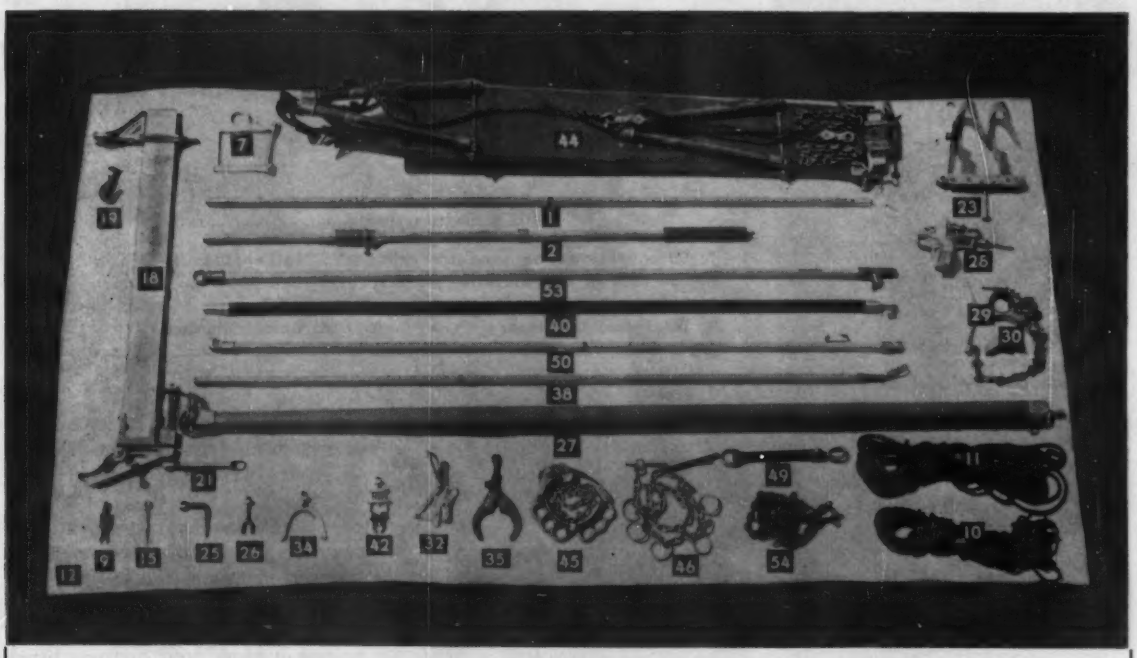
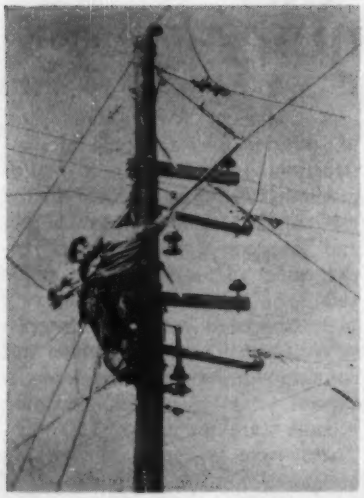
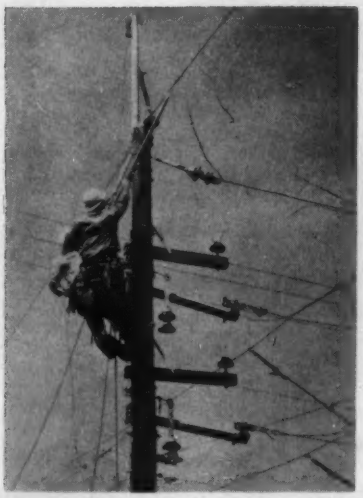


FIG 3—TOOLS for replacing insulators and crossarms on 3-phase vertical tap from a 12-kv line are:

(1) Alligator
(2) All-purpose grip stick
(7) Arm sling
(9) Bolt holder
(10) Single-sheave rope block
(11) Double-sheave rope block
(12) Canvas
(15) Cotter key tool
(18) Dead-end board
(19) Come-along wrench
(21) Ratchet wrench
(23) Disc insulator yoke
(25) Drift pin
(26) Extension link holder
(27) Gin pole
(28) Fin pole attachment
(29) Gin pole chain yoke
(30) Spacer block
(32) Hot-line come-along
(34) Insulator fork
(35) Adjustable insulator fork
(38) Mechanical hand
(40) Pigtail stick
(42) Rotary pliers
(44) Safety platform
(45, 46) Snubbing devices
(49) Strain link
(50) Universal stick
(53) Wire tong 1½-in.
(54) Wire tong saddle



Conductors—Position 1



Conductor Main—Position 2

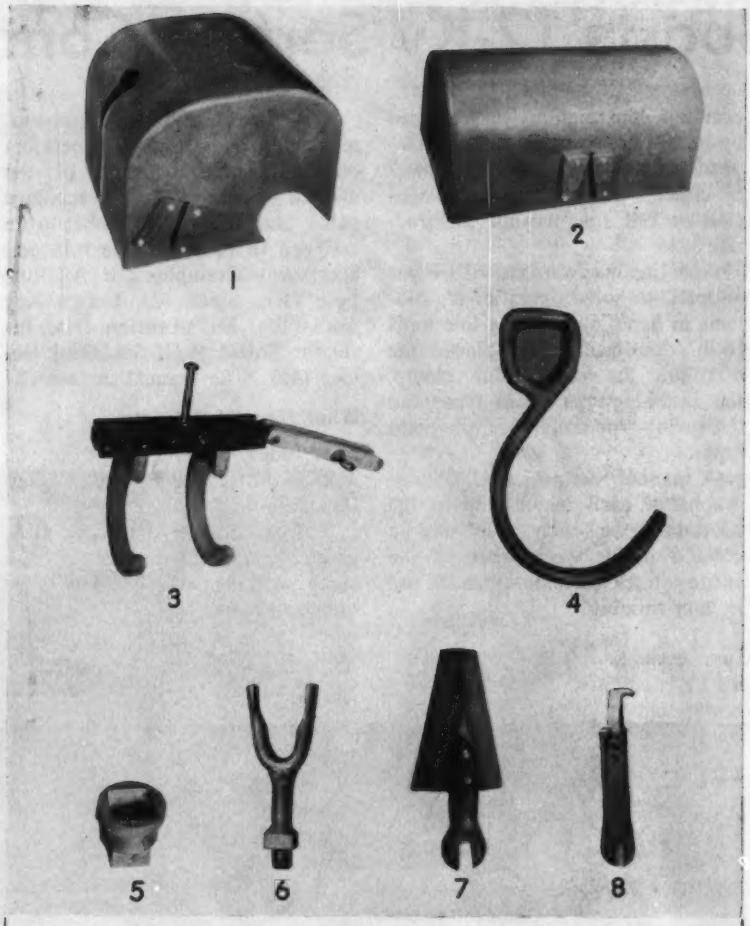
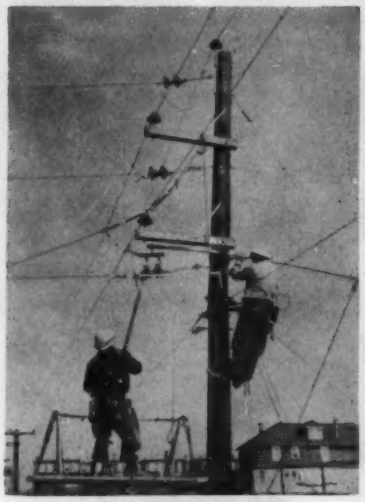
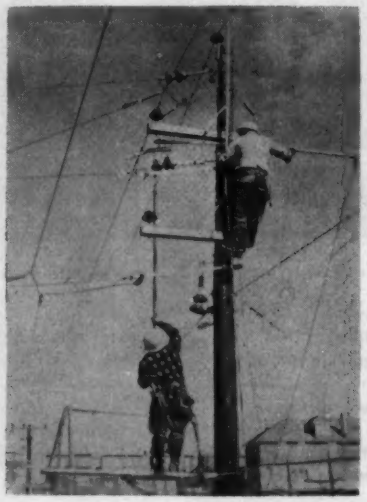


FIG 4—NEW TOOLS developed were:

1. Slide tension disc insulator shield
2. Full tension disc insulator shield
3. Disc insulator yoke
4. Disc insulator hook
5. Locknut adapter
6. Extension link holder
7. Wedge
8. Cotter key tool



Conductor Tap—Position 2



Conductors—Position 3

General foremen and safety instructors from all divisions (not assigned to group) were free to observe all operations.

A suggestion box conveniently located on the training site drew from trainees ideas on safety, tools and methods. Each suggestion was carefully considered, and a report posted in every crew quarters listed suggestions adopted and reasons for dropping others.

Foremen and linemen, after completing school training, extended the program in their respective divisions to make all linemen on the system familiar with the latest work methods.

Results have been most gratifying Linemen have become proficient in

SEQUENCE OF OPERATION

CONDUCTORS - POSITION NO. 1

1. Support insulator string with wire tong (53)-disc insulator yoke assembly (23).
2. Line up dead end clamp and insulator eyes with drift pin (25) and rotary pliers (42).
3. Clamp clothes pin on dead end clamp to maintain alignment.
4. Withdraw drift pin and insert bolt and cotter key.
5. Lower main line conductor and tie.

CONDUCTORS - POSITION NO. 2

6. Hook rope block (10) - strain link (49) assembly behind eyebolt of tap position #1
7. Return main conductor to original position and tie.
8. Attach wire tong saddle (54) just below crossarm.
9. Clamp wire tong - disc insulator yoke assembly in saddle.
10. Line up dead end clamp and insulator eyes with drift pin and rotary pliers.
11. Withdraw drift pin and insert bolt and cotter key.

CONDUCTORS - POSITION NO. 3

12. Install arm sling (7) on position #2 crossarm and attach rope block assembly.
13. Return main conductor to original position and tie.
14. Attach wire tong saddle just below crossarm.
15. Clamp wire tong - disc insulator yoke assembly in wire tong saddle.
16. Line up insulator string and dead end clamp eyes with drift pin and rotary pliers.
17. Withdraw drift pin and insert bolt and cotter key.

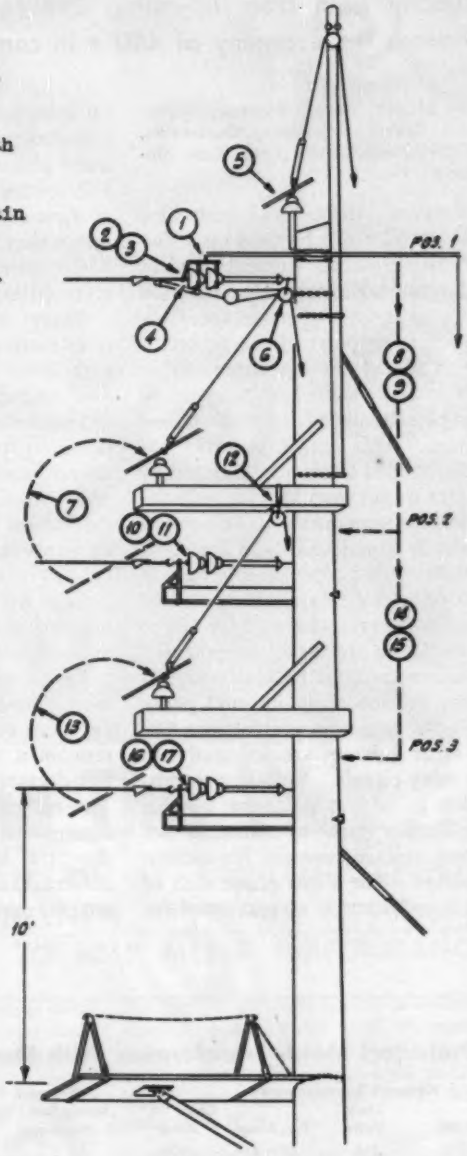


FIG 5—PAGE FROM MANUAL shows procedure for 3-phase, vertical tap from a 12-kv line, replacing the insulators and reconnecting the crossarms. The various positions are assumed by the linemen in the photographs on the facing page

the use of hot line tools. They show great interest in hot line-tool maintenance of lines. Instituting a uniform hot line program has stimulated employee thinking and encouraged improvement of work methods. And many jobs which previously required line outages are now worked with hot line tools.

Modifying 216-V Protectors for 480

Capacity gain from up-rating 216-v network protectors enhances the economy of 480 v in commercial-load areas

E. W. STOHR, Design Engineer, Protective Devices Engineering Department, Westinghouse Electric Corp, East Pittsburgh, Pa.

Network protectors built for 216-v service can be used on 480-v systems provided control devices and fuses are changed to function properly at the higher voltage. Current-carrying parts of the protector are insulated for operation up to 600 v and hence can carry more than twice the kva load at the higher voltage. This gain in protector capacity, added to savings afforded by greater transformer spacing, will enhance the economies of 480-v networks in commercial-load areas.

Relays that operate directly at 480 or 216-v relays with potential transformers may be used for 480 v. If the latter are used, the potential transformers must be built with extreme voltage accuracy; and phase shift compensation must assure that no error voltages are reflected into the relay circuit. Voltage compensation is accomplished by suitable transformer taps to maintain the output voltage constant for various loadings. The slight phase shift of the transformer is compensated for by using identical loading on those transformers where an uncompensated phase shift would produce an appreciable relay error. Because of these compensations, the network relays may be used on either 216 or 480-v systems without changing the relay settings.

Relays used directly on 480 v offer more simple and direct circuits with fewer components and, therefore, less chance for malfunctioning of equipment. These relays are definitely to be preferred where they do not conflict with safety practices and where the necessary test and calibration set-up does not represent an unwarranted added expense. Use of 480 v as a secondary network voltage will increase, and 480-v relays will often be numerous enough to justify separate testing facilities.

On conventional networks of more than four feeders an outage of one does not impose abnormal current on a network protector if the transformers are not overloaded. The reason is that the protector's continuous current rating is more than the transformer's continuous current rating. With two feeders out the overload, if any, depends upon the number and spacing of primary feeders for a given load area. At 480 v the overloading is not so severe as for a comparable 216-v system because the jump from 216 to 480 v represents a 120% increase in voltage while transformer kva is boosted only 100%. However, two feeders out of service still represent an overload to the protectors as used on most systems.

Special protectors, which can be applied without exceeding their rated current, can be used with transformers loaded for emergency conditions, according to the ASA guide. These are similar to standard units, except that Class H insulation is substituted for Class A on current transformers and network relays which operate nearest the limit for Class A insulation. Relay potential transformers used for 480-v network protectors in such installations also must be Class H insulated.

Where applied to a network protector, the position indicating lamp is connected across the phase to which the CNJ relay is connected. Although the resistance of this lamp is approximately 1,200 ohms, the artificial load which it represents is sufficient to change the torque in the CNJ relay from opening to closing torque. Consequently, network protectors equipped with indicating lamps will close on a dead network even though no load is connected.

This does not hold for higher voltage network protectors where autotransformers are used to supply control voltage. The indicating lamp connected to the autotransformer does not serve as an artificial load.

For voltages above 250 the enclosed copper fuse is not suitable as the fuse cannot clear all possible faults. Without the enclosure, the fuse is able to clear currents up to 35,000 amp and may therefore be used on 480-v network protectors up to 2,000-amp continuous rating.

The enclosed copper fuse has less time delay at high currents than the alloy fuse and may interrupt certain faults within the interrupting rating of the protector before the network relays can trip the protector.

Protectors Match Transformers With Margin for Overload

Network Transformers			Network Protectors			
KVA	Line Volts	F.L. Amp	Class "A" Amp	Insulation % Margin(a)	Class "H" Amp.	Insulation % Margin(a)
225	216	601.4	800	33.0	(c)	....
300	216	801.9	1200	49.6	(b)	....
500	216	1336.5	1600	19.9	1750	30.9
500	480	601.4	800	33.0	(c)	....
600	216	1603.8	2000	24.7	2250	40.2
600	480	721.7	1200	66.2	(b)	....
750	216	2004.8	2500	24.7	2750	37.1
750	480	902.1	1600	66.3	(b)	....
1000	216	2673.0	3000	12.3	3500	32.1
1000	480	1202.8	1600	33.0	1750	45.4
1500	480	1804.2	2500	39.6	2750	52.4
2000	480	2405.6	3000	24.6	3500	45.4

(a) $\%\ \text{Margin} = \dfrac{\text{Protector F.L. Amp} - \text{Transformer F.L. Amp}}{\text{Transformer F.L. Amp}} \times 100$

(b) Class "H" Protector not required—Sufficient Margin with Class "A"
(c) Class "H" Protector not required—Use 1200/5 CT and next larger fuse

NEW S-1 SOCKET

Let's Look at Metering This Way...

BEHIND A QUALITY METER SHOULD BE PROTECTION BY A QUALITY SOCKET. THAT'S WHY GENERAL ELECTRIC DESIGNED THE NEW, IMPROVED S-1 SOCKET OFFERING YOU SEVEN IMPORTANT BENEFITS TO HELP METER PERFORMANCE.

The best possible protection is needed for your important metering investment. That's what you look for in a watthour meter socket. Now, the new, improved General Electric S-1 Square Meter Socket has these big benefits which help give top meter performance:

TRUE VERSATILITY. New S-1 comes with one, two, or no hubs, 1¼ or 1½ inches. Mount vertically or horizontally by simply interchanging terminals 90 degrees. Fifth and sixth terminals are added in seconds with only a screwdriver.

PERFECT KNOCKOUTS. Pre-scoring on both sides provides positive knockout every time. One-way knockouts are located on all sides not having hubs.

EASY WIRING. External hubs, large inside working space and lay-in type terminals, requiring only 45 degree wire bend—all make wiring easier, quicker.

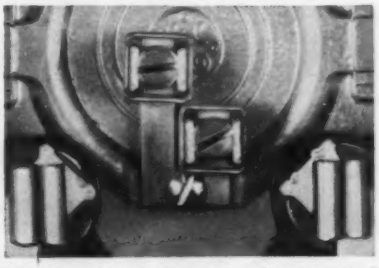
POSITIVE GROUND. You have choice of new lay-in bus-type or serrated strap terminals. Both give positive ground, even with different wire sizes. Bus-type terminal assembly is easily rotated 180 degrees for use of back breakout.

EASY ACCESS. Unique weather-tight snap-lock cover can be removed and replaced in seconds without tools.

100-AMP CAPACITY for growing loads.

HIGH CORROSION RESISTANCE for better all-weather meter protection.

For complete details on the S-1 Socket contact your nearby G-E Apparatus Sales Office or Authorized Distributor . . . or write for bulletin GEA-6563 to General Electric Co., Section 625-5, Schenectady 5, N. Y.



The new S-1 bus-type grounding terminal

GENERAL ELECTRIC

NEWEST REASON WHY ALL TRANSFORMERS ARE NOT ALIKE

New service-continuity watchdog

New breaker, new operating-handle sequence, and valve-type arresters assure maximum service continuity with General Electric self-protected distribution transformers

With the use of self-protected transformers steadily increasing, General Electric has developed a new breaker and a new reset handle to help utilities maintain the best possible service, especially in overload areas. The breaker provides simultaneous opening of all contacts, and the new reset handle virtually eliminates unintentional opening of the breaker by linemen.

Designated "T-2", the new breaker is used on all self-protected G-E transformers rated 37½ kva and above, together with G.E.'s dependable, long-life Magne-valve arresters

and internal fuses. Twenty per cent shorter than other types of breakers for similar application, the new breaker helps keep tank heights down.

Reduces chance of feedback burnouts

One driveshaft, common to all contacts, operates all breaker poles simultaneously. It is impossible, therefore, for the contacts to open on one line only. This eliminates the possibility of damage to motors due to undervoltage through a single closed contact and connected load.

Helps eliminate unintentional opening

Following the unique operating sequence, the lineman merely moves the handle *down* against the stop in the "closed" position to reset the signal light. So there is no possibility of accidentally tripping the breaker. It is also possible for the lineman to test the overload lamp without removing it—another unique feature.

Emergency device provides for 15% overloads

Uprated at the factory to carry an additional 20% of load before tripping out, the new breaker also includes an emergency overload device. In a few seconds the lineman can raise the trip temperature, permitting the transformer to carry an additional 15% of load before the breaker trips. This makes it possible to maintain service to the customer until the power company can replace the transformer with a higher-rated unit.

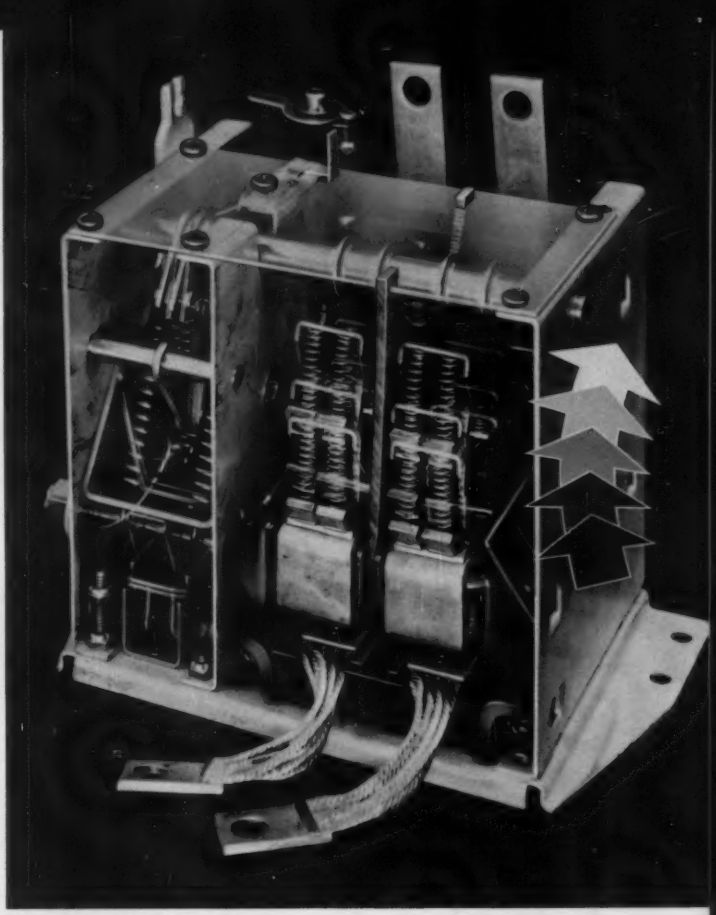
All transformers are not alike

The new circuit-breaker and new reset handle sequence are just two of the main advantages of General Electric distribution transformers. Others include *Formex* wire* to increase reliability and cut tank size, *Nitrile rubber gaskets* to give superior sealing, *Strenicor clamps* to prevent terminal breakage, and many others—evidence that all transformers are not alike.

For complete information contact your nearest G-E Apparatus Sales Office or G-E Agent—or write to Section 431-49 General Electric Company, Schenectady 5, New York.

LIVE BETTER ELECTRICALLY

**Reg. Trademark of General Electric Co.*



IT IS IMPOSSIBLE for contacts to open on one line only. For with the G-E design, one driveshaft operates all poles simultaneously.

NO ACCIDENTAL TRIPPING is possible with G.E.'s unique new operating sequence for breaker reset handle. Lineman merely moves handle *down* against stop in "closed" direction to reset light.

Progress Is Our Most Important Product

GENERAL ELECTRIC

APPLIED RESEARCH "Demonstration streets" at General Electric's Hendersonville, N.C., plant permit study of lighting problems on all classes of streets, under all light sources, and for different pavements. Here, Justin Peterson, manager of advance engineering, supervises a light measurement reading of a mercury vapor system on the "main business" street.

You get the results of continuing research in every General Electric street lighting system

Your new General Electric street lighting equipment resulted from yesterday's G-E research findings. And your benefits from today's research will show in even higher quality lighting soon.

Highest value for your street lighting dollar is assured by industry's newest and most complete laboratory, development, and proving facilities. For example, you can compare equipment light output and distribution from the work of a fully equipped photometric laboratory.

On four full-sized demonstration streets, application experiments are carried on for information on present products and projects for tomorrow. Tests are run for customers, at their request, and a trained, professional engineering staff devotes all its time toward improvements to serve your present and future street lighting needs.

Continuing research by General Electric has made major contributions in available equipment and future tools to better serve your public lighting program.

VISION-ENGINEERED SYSTEMS

Let G.E. help your street lighting program on a ***vision-engineered system*** basis. On every lighting project, regardless of size or type, General Electric offers you, in addition to research and development leadership:

PROJECT RESPONSIBILITY—one source of supply for *all* your street lighting needs. This includes full lines of filament, mercury, and fluorescent luminaires, and a complete selection of control and auxiliary equipment.

COMPLETE APPLICATION ASSISTANCE—expert start-to-finish aid from field and factory lighting specialists.

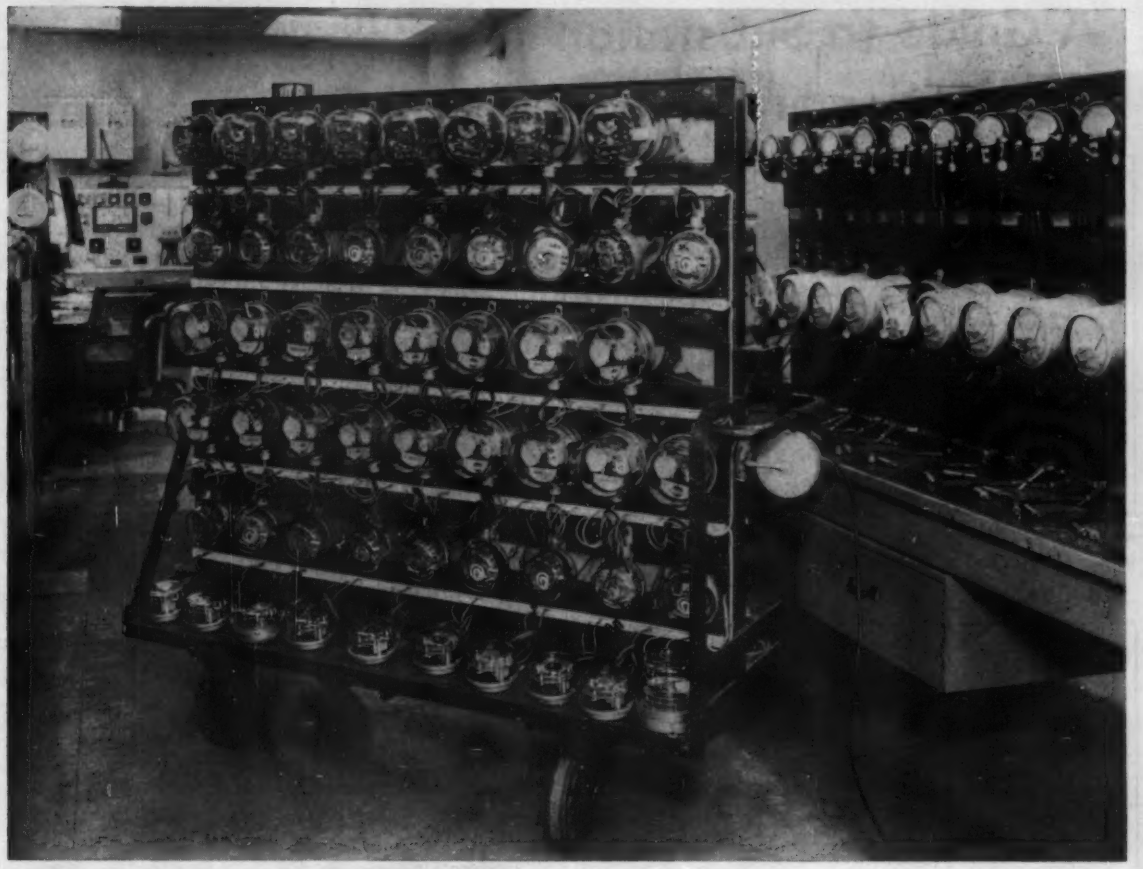
Get the full ***vision-engineered system*** story from your nearest Apparatus Sales Office or authorized agent! General Electric Co., Schenectady, N. Y.

LIVE BETTER ELECTRICALLY

452-170

VISION-ENGINEERED STREET LIGHTING SYSTEMS

GENERAL ELECTRIC



▲ **TIME SWITCHES** are mounted on specially arranged rack truck and are tested for 12, 18 or 24-hr periods. Rack arrangement reduces time and space required for testing switches. The method was developed by Detroit Edison Co

METERING—Testing

Gang Testing Time Switches Economical

EDWARD J. BAILEY, Detroit Edison Co, Detroit, Mich.

Detroit Edison Co has a method of gang testing nipplebase water heater time switches by mounting them on an ordinary rack truck of the type used for transporting meters indoors.

Hanger studs of the rack truck were welded to steel strips, nine in a row, and five rows on each side of the truck. Hanger studs of each row were bolted to the corresponding row on the opposite side. The hanger rows were connected to each other with a common ground wire. Tap-o-line, or connector strips connect meter leads of the water heater time switches.

The connector strips, although connected, can be isolated by removing the male plug. Tap-o-line is connected to the center pole of a double-pole, double-throw switch.

Power at 220 V

Power is supplied at 220 v through a service cord which is connected to two poles of a switch. A test terminal was connected to the other two poles of the switch. When the switch is in the direction of the ground check, one prod of the high-voltage checker is connected to the test terminal and the other to the common ground strip. This checks all time switches for ground. The switch in the opposite direction supplies power to all switches.

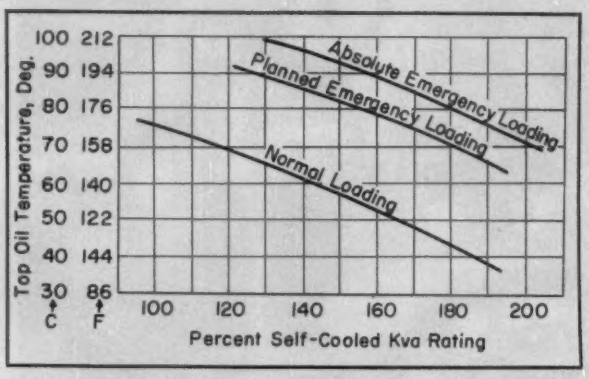
The time switches are set at a specific time, and at that time the truck is plugged into a service outlet which is a 220-v polarized plug. The service cord is drawn off a retractable reel to the truck position. All switches start simultaneously.

Test runs may be for 12, 18, or 24 hrs. Upon completion, the truck is disconnected and each switch checked for the time. The test date is marked inside the switch before it is placed on the test truck.

The test truck saves 1.4 min per time switch tested, as compared to

(Continued on page 100)

A Guide to Substation Transformer Loading Capabilities and Maximum Oil Temperatures



MAXIMUM PERMISSIBLE TOP OIL TEMPERATURE for conditions of normal planned and absolute emergency loading

Table 1—Normal Self-Cooled (OA) Capabilities

3-Ph Bank Rat'g	% Load Fact	Usual Seasonal Loading—Normal OA Rating									
		Jul-Aug 100 F		Jun-Sep 90 F		May-Oct 86 F		Apr-Mar 75 F		Feb-Nov 66 F		Jan-Dec 59 F	
		Kva	OT	Kva	OT	Kva	OT	Kva	OT	Kva	OT	Kva	OT
150	95	149	74	155	73	164	72	170	71	179	69	185	68
	85	155	73	161	72	170	71	176	70	185	68	191	67
	75	161	72	167	71	176	70	182	69	191	67	197	66
	65	167	71	173	70	182	69	188	68	197	66	203	65
	55	173	70	179	69	188	68	194	67	203	65	209	64
225	95	223	74	232	73	245	72	254	71	268	69	277	68
	85	232	73	241	72	254	71	263	70	277	68	286	67
	75	241	72	250	71	263	70	272	69	286	67	295	66
	65	250	71	259	70	272	69	281	68	295	66	304	65
	55	259	70	268	69	281	68	290	67	304	65	313	64
300	95	297	74	309	73	327	72	339	71	357	69	369	68
	85	309	73	321	72	339	71	351	70	369	68	381	67
	75	321	72	333	71	351	70	363	69	381	67	393	66
	65	333	71	345	70	363	69	375	68	393	66	405	65
	55	345	70	357	69	375	68	387	67	405	65	418	64
450	95	446	74	463	73	491	72	508	71	536	69	554	68
	85	463	73	482	72	508	71	527	70	554	68	572	67
	75	482	72	499	71	527	70	545	69	572	67	590	66
	65	499	71	518	70	545	69	563	68	590	66	608	65
	55	518	70	536	69	563	68	581	67	608	65	626	64
600	95	594	74	618	73	654	72	678	71	714	69	738	68
	85	618	73	642	72	678	71	702	70	738	68	762	67
	75	642	72	666	71	702	70	726	69	762	67	786	66
	65	666	71	690	70	726	69	750	68	786	66	810	65
	55	690	70	714	69	750	68	774	67	810	65	834	64
750	95	742	74	772	73	818	72	848	71	892	69	922	68
	85	772	73	802	72	848	71	878	70	922	68	952	67
	75	802	72	832	71	878	70	908	69	952	67	982	66
	65	832	71	862	70	908	69	938	68	982	66	1,012	65
	55	862	70	892	69	938	68	968	67	1,012	65	1,042	64

Regulation: Jul & Aug loading 4%; Jan & Dec loading 5%
OT = Oil Temperature

NOTE: For other sizes of banks multiply the above loadings by its appropriate factor. For example, the loadings on a 1,500-kva, 3-phase bank, would be 10 times the loadings shown for a 150-kva bank, or 1,490-kva in July or August at 95% load factor.

Accompanying data are adapted from operating practices of the Distribution Department, Oklahoma Gas & Electric Co. They are applicable for the South Central area of United States, and will serve as a guide to compilation of data and curves for other areas.

This guide presents substation transformer loading capabilities for three types of operation—"normal", "planned emergency," and "absolute emergency" loadings. However, the capabilities tabulated here refer specifically to thermal characteristics of transformer windings only. Leads, bushings, buses, disconnect switches, etc, are not included.

Data presented here are in agreement with ASA Guide for Loading Distribution and Power Transformers, and are conservative for modern transformers.

1. PERTINENT TERMS used in this guide.

1a. AMBIENT TEMPERATURE, as measured by thermometer or estimated by experience, is expressed as the probably maximum temperature (deg F) for the day or month under actual consideration.

1b. TYPES OF OIL COOLING considered are self-cooled (type OA) and fan-cooled (type FA).

1c. LOAD FACTOR in percentage is average load for a given period divided by maximum load for that same period. It is computed for usual or average 24-hr weekday loadings.

1d. NORMAL LOADING is a usual day-to-day loading operation. Older transformers (manufactured prior to about 1935) and newer units will, in general, have no unusual loss of insulation life and the winding hottest-spot temperature will seldom exceed 95 C.

1e. PLANNED EMERGENCY LOADING is the infrequent higher-than-normal loadings associated with planned occasional line and apparatus inspections. By this loading the transformer will suffer some accelerated loss of remaining insulation life. This loss may approach 1.5% of each 24 hr of such continuous loading, and winding hottest spot may approach about 120 C.

1f. ABSOLUTE EMERGENCY LOADING is the

(*Continued on page* 98)

Recent Regulator Advances call for a Reappraisal of the old question of which to buy . . .

REGULATORS OR LTC?

by D. D. MacCarthy
Manager—Engineering
Voltage Regulator Product Section

Selection of the proper type regulation usually boils down to dollars and cents. Recent improvements in single-phase step regulators, particularly G.E.'s ML-32 with its standard Load Bonus feature (increases current capacity by 60% at ±5% regulation with no loss of short-circuit capability), have changed the economic picture from what we have known it to be in the past.

It should be noted, however, that there is no "pat" answer as to which type of regulation should be used. Application specifications may call for single-phase step regulators, LTC transformers, three-phase step regulators, or induction regulators.

The charts at the right give the new economic picture for Load Tap Changer equipment and pole-type regulators on an equipment-first-cost basis. Additional factors, such as installation costs and auxiliary equipment, might modify this picture somewhat.

Figure 1 represents a 4-kv wye system. It shows that LTC provides ±10% regulation over a broad range. However, on circuits up to 3000 kva of load, the G-E ML-32 single-phase step voltage regulator offers substantial cost advantages.

Figure 2 covers a 12- or 13-kv wye system. Here, again, the same general relationship exists.

These charts show that the General Electric ML-32 single-phase step voltage regulator usually, within its range, offers *by far* the more economical type of regulation.

For more information on regulator economics, write Section 423–24, General Electric Company, Schenectady 5, New York, or contact your G-E sales engineer or agent.

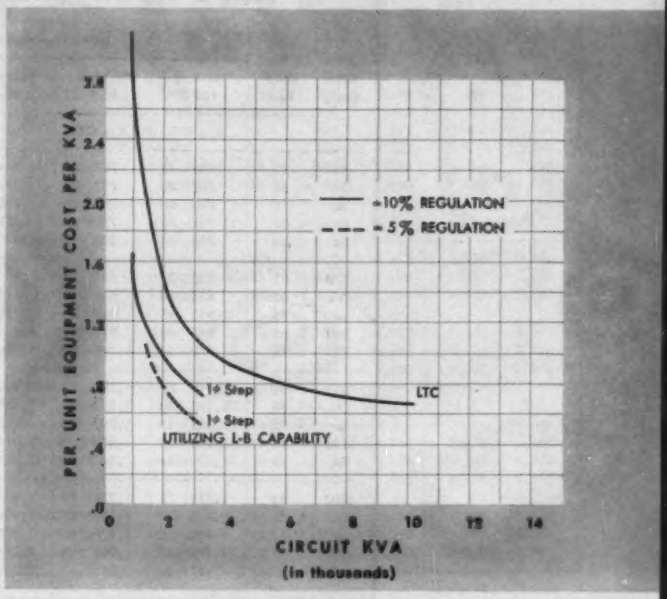


FIGURE 1. Regulating-equipment costs per kva plotted against load on a 4-kv wye-connected system.

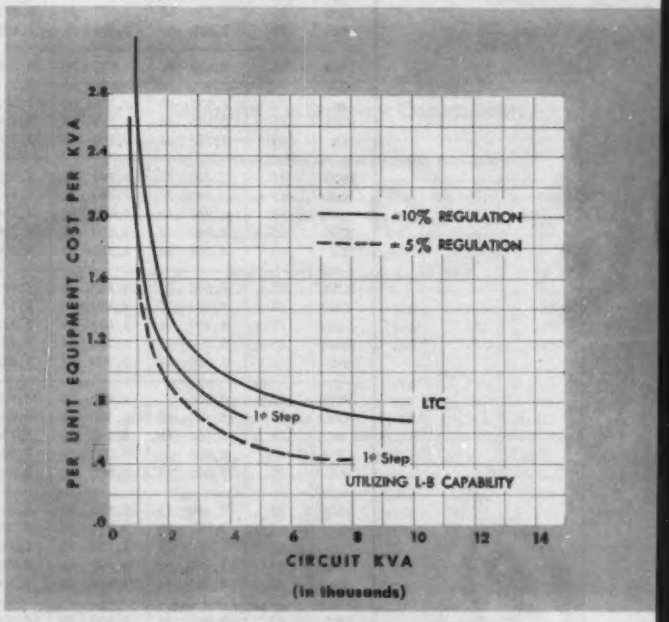


FIGURE 2. Per-unit costs for various regulating equipments on 12-kv or 13-kv wye systems.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Table 2—Normal Fan-Cooled (FA) Capabilities

3-Ph Bank Rat'g	% Load Fact	Usual Seasonal Loading—Normal FA Rating											
		Jul-Aug 100 F		Jun-Sep 90 F		May-Oct 86 F		Apr-Mar 75 F		Feb-Nov 66 F		Jan-Dec 59 F	
		Kva	OT	Kva	OT	Kva	OT	Kva	OT	Kva	OT	Kva	OT
600	95	684	72	708	70	744	68	768	66	804	62	828	60
OA	85	708	70	732	68	768	66	792	64	828	60	852	58
or	75	723	68	756	66	792	64	816	62	852	58	876	56
690	65	756	66	780	64	816	62	840	60	876	56	900	54
FA	55	780	64	804	62	840	60	864	58	900	54	924	52
750	95	855	72	885	70	930	68	960	66	1,005	62	1,035	60
OA	85	885	70	915	68	960	66	990	64	1,035	60	1,065	58
or	75	915	68	945	66	990	64	1,020	62	1,065	58	1,095	56
862	65	945	66	975	64	1,020	62	1,050	60	1,095	56	1,125	54
FA	55	975	64	1,005	62	1,050	60	1,080	58	1,125	54	1,155	52
1000	95	1,140	72	1,180	70	1,240	68	1,280	66	1,340	62	1,380	60
OA	85	1,180	70	1,220	68	1,280	66	1,320	64	1,380	60	1,420	58
or	75	1,220	68	1,260	66	1,320	64	1,360	62	1,420	58	1,460	56
1150	65	1,260	66	1,300	64	1,360	62	1,400	60	1,460	56	1,500	54
FA	55	1,300	64	1,340	62	1,400	60	1,440	58	1,500	54	1,540	52
1500	95	1,710	72	1,770	70	1,860	68	1,920	66	2,010	62	2,070	60
OA	85	1,770	70	1,830	68	1,920	66	1,980	64	2,070	60	2,130	58
or	75	1,830	68	1,890	66	1,980	64	2,040	62	2,130	58	2,190	56
1725	65	1,890	66	1,950	64	2,040	62	2,100	60	2,190	56	2,250	54
FA	55	1,950	64	2,010	62	2,100	60	2,160	58	2,250	54	2,310	52
2000	95	2,280	72	2,360	70	2,480	68	2,560	66	2,680	62	2,760	60
OA	85	2,360	70	2,440	68	2,560	66	2,640	64	2,760	60	2,840	58
or	75	2,440	68	2,520	66	2,640	64	2,720	62	2,840	58	2,920	56
2300	65	2,520	66	2,600	64	2,720	62	2,800	60	2,920	56	3,000	54
FA	55	2,600	64	2,680	62	2,800	60	2,880	58	3,000	54	3,080	52
2500	95	2,850	72	2,950	70	3,100	68	3,200	66	3,350	62	3,450	60
OA	85	2,950	70	3,050	68	3,200	66	3,300	64	3,450	60	3,550	58
or	75	3,050	68	3,150	66	3,300	64	3,400	62	3,550	58	3,650	56
2875	65	3,150	66	3,250	64	3,400	62	3,500	60	3,650	56	3,750	54
FA	55	3,250	64	3,350	62	3,500	60	3,600	58	3,750	54	3,850	52
3000	95	3,720	72	3,840	70	4,020	68	4,140	66	4,320	62	4,440	60
OA	85	3,840	70	3,960	68	4,140	66	4,260	64	4,440	60	4,560	58
or	75	3,960	68	4,080	66	4,260	64	4,380	62	4,560	58	4,680	56
3750	65	4,080	66	4,200	64	4,380	62	4,500	60	4,680	56	4,800	54
FA	55	4,200	64	4,320	62	4,500	60	4,620	58	4,800	54	4,920	52
3750	95	4,650	72	4,800	70	5,025	68	5,175	66	5,400	62	5,550	60
OA	85	4,800	70	4,950	68	5,175	66	5,325	64	5,550	60	5,700	58
or	75	4,950	68	5,100	66	5,325	64	5,475	62	5,700	58	5,850	56
4687	65	5,100	66	5,250	64	5,475	62	5,625	60	5,850	56	6,000	54
FA	55	5,250	64	5,400	62	5,625	60	5,775	58	6,000	54	6,150	52
5000	95	6,200	72	6,400	70	6,700	68	6,900	66	7,200	62	7,400	60
OA	85	6,400	70	6,600	68	6,900	66	7,100	64	7,400	60	7,600	58
or	75	6,600	68	6,800	66	7,100	64	7,300	62	7,600	58	7,800	56
6250	65	6,800	66	7,000	64	7,300	62	7,500	60	7,800	56	8,000	54
FA	55	7,000	64	7,200	62	7,500	60	7,700	58	8,000	54	8,200	52
6000	95	7,440	72	7,680	70	8,040	68	8,280	66	8,640	62	8,880	60
OA	85	7,680	70	7,920	68	8,280	66	8,520	64	8,880	60	9,120	58
or	75	7,920	68	8,160	66	8,520	64	8,760	62	9,120	58	9,360	56
7500	65	8,160	66	8,400	64	8,760	62	9,000	60	9,360	56	9,600	54
FA	55	8,400	64	8,640	62	9,000	60	9,240	58	9,600	54	9,840	52
7500	95	9,300	72	9,600	70	10,050	68	10,350	66	10,800	62	11,100	60
OA	85	9,600	70	9,900	68	10,350	66	10,650	64	11,100	60	11,400	58
or	75	9,900	68	10,200	66	10,650	64	10,950	62	11,400	58	11,700	56
9375	65	10,200	66	10,500	64	10,950	62	11,250	60	11,700	56	12,000	54
FA	55	10,500	64	18,000	62	11,250	60	11,550	58	12,000	54	12,300	52
10000	95	12,400	72	12,800	70	13,400	68	13,800	66	14,400	62	14,800	60
OA	85	12,800	70	13,200	68	13,800	66	14,200	64	14,800	60	15,200	58
or	75	13,200	68	13,600	66	14,200	64	14,600	62	15,200	58	15,600	56
12500	65	13,600	66	14,000	64	14,600	62	15,000	60	15,600	56	16,000	54
FA	55	14,000	64	14,400	62	15,000	60	15,400	58	16,000	54	16,400	52

Regulation: Jul & Aug loading 5%; Jan & Dec loading 6%
OT = Oil Temperature

exceedingly heavy loading associated with either line or equipment failure. On such operations transformers may suffer a loss of remaining insulation life as much as 6% for each 24 hr of continuous loadings, and may have a maximum winding hottest spot of 135 C.

2. LOADING PROCEDURE. Accompanying tables show usual transformer capabilities for OA and FA cooling for certain load factors and seasons, and for the three types of loading. The tables should be used as follows:

2a. LOAD FACTOR to be used is the proper one for the bank, or if unknown, for a known similarly loaded bank. Load factors are not applicable to either of the above mentioned emergency loadings.

2b. SEASON is to be selected as indicated by month for planning or by ambient temperature for an actual case.

2c. OIL TEMPERATURE is a corresponding maximum permissible value for each loading, as shown in OT column. Maximum oil temperature will not be reached until about two or three hours following a change in load.

3. REPLACEMENT PRACTICE. Hottest-spot winding temperature to 95 C for continuous loading and to 105 C for seasonal loading is satisfactory. For progressively increasing loads, following transformer replacement practice should usually be followed.

3a. BANKS UNDER 600 KVA (OA) RATING. Load to normal self-cooled (OA) capability as shown in Table 1. Occasional loading for a few days at 10% above this value is satisfactory. Replace or otherwise relieve the transformer bank following one season of such loading.

3b. BANKS OF 600 KVA (OA) RATING AND LARGER. Load to normal self-cooled (OA) capability as shown in Table 1. Fans should be installed when the self-cooled (OA) capability is exceeded. Then load to normal fan-cooled (FA) capability as shown in Table 2. Occasional loading for a few days at 10% above this value is satisfactory. Replace or otherwise relieve the bank following one season of such loading.

4. TRANSFORMER LOADING AND OIL TEMPERATURE CURVES. Accompanying curves are to serve as basic references for special cases not covered in the tables. These curves are applicable for the South Central area of the U. S.

Table 3—Planned Emergency Capabilities

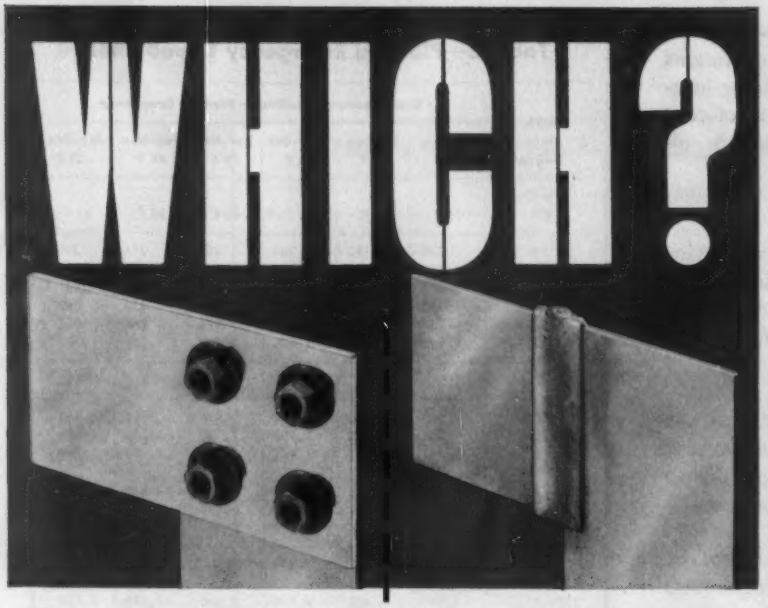
3-Ph Bank Rating	Usual Seasonal Loading — Planned Emergency					
	Jul-Aug 100 F	Jun-Sep 95 F	May-Oct 86 F	Apr-Mar 75 F	Feb-Nov 66 F	Jan-Dec 59 F
OA	91 C	90 C	88 C	86 C	85 C	83 C
150	188	192	200	207	216	221
225	281	288	299	310	324	331
300	375	384	399	414	433	441
450	563	576	600	622	650	662
600	750	768	800	828	864	882
750	938	960	1,000	1,040	1,080	1,100
OA/FA	86 C	85 C	83 C	82 C	80 C	79 C
600/690	840	860	880	910	935	950
750/862	1,050	1,075	1,100	1,140	1,170	1,185
1000/1150	1,400	1,430	1,470	1,520	1,560	1,580
1500/1725	2,100	2,150	2,200	2,280	2,340	2,370
2000/2300	2,800	2,860	2,930	3,040	3,120	3,160
2500/2675	3,500	3,580	3,670	3,800	3,900	3,950
OA/FA	82 C	80 C	79 C	77 C	75 C	74 C
3000/3750	4,560	4,680	4,740	4,880	5,170	5,130
3750/4687	5,700	5,850	5,925	6,120	6,340	6,400
5000/6250	7,600	7,800	7,900	8,150	8,450	8,550
6000/7500	9,120	9,350	9,475	9,775	10,150	10,250
7500/9375	11,400	11,700	11,850	12,240	12,675	12,800
10,000/12,500	15,200	15,600	15,800	16,300	16,900	17,100

Regulation: Jul & Aug loading 5%; Jan & Dec loading 6%
Maximum top oil temperatures are shown at top of each column, in each section.

Table 4—Absolute Emergency Capabilities

3-Ph Bank Rating	Usual Seasonal Loading — Absolute Emergency					
	Jul-Aug 100 F	Jun-Sep 95 F	May-Oct 86 F	Apr-Mar 75 F	Feb-Nov 66 F	Jan-Dec 59 F
OA	97 C	96 C	93 C	92 C	88 C	87 C
150	209	213	222	230	240	245
225	312	320	332	344	360	367
300	416	426	443	460	480	490
450	625	640	666	690	720	735
600	832	852	888	920	960	980
750	1,040	1,070	1,110	1,160	1,200	1,220
OA/FA	91 C	89 C	87 C	85 C	83 C	82 C
600/690	935	950	980	1,015	1,040	1,050
750/862	1,170	1,185	1,220	1,270	1,300	1,315
1000/1150	1,560	1,580	1,630	1,690	1,730	1,750
1500/1725	2,320	2,370	2,440	2,540	2,600	2,620
2000/2300	3,100	3,180	3,260	3,380	3,460	3,500
2500/2875	3,880	3,980	4,070	4,225	4,325	4,375
OA/FA	85 C	83 C	82 C	80 C	78 C	76 C
3000/3750	5,070	5,200	5,250	5,430	5,580	5,700
3750/4687	6,340	6,500	6,550	6,800	6,975	7,125
5000/6250	8,450	8,650	8,750	9,050	9,300	9,500
6000/7500	10,150	10,380	10,500	10,850	11,150	11,400
7500/9375	12,675	13,000	13,100	13,600	14,000	14,250
10,000/12,500	16,900	17,300	17,500	18,100	18,600	19,000

Regulation: Jul-Aug loading 5.5%; Jan-Dec loading 6.5%
Maximum top oil temperatures are shown at top of each column, in each section.



When it comes to connecting bus, single or multiple—CADWELD Electrical Connections have no equal. GET THE BEST... GET CADWELD.

BOLTED bus connection

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CADWELD® bus connection

1. CADWELD is a BUTT connection — no waste in material. On 6" x 6" x ¼" Ell connection save 3 lbs. of copper.
2. No Drilling.
3. No Tinning.
4. Lower Cost.
5. No Wasted Space.
6. Cannot Loosen.
7. Cannot Corrode.
8. No Maintenance.

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Erico Products, Inc.

2070 E. 61st Place Cleveland 3, Ohio

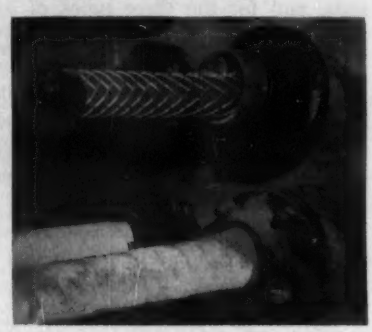
IN CANADA: ERICO INCORPORATED, 3571 Dundas St., West, Toronto 9, Ontario

Switches Gang Tested

(*Continued from page* 95)

hanging switches on a permanent test board and removing them when the test is completed. The test truck saves 75% of the floor area formerly used for testing fewer switches.

DISTRIBUTION—Construction



GRIP installed with pipe flanges in manhole at bottom of the grade kept cable from migrating in the manhole

Woven Grip Anchors Cable On Grade

F. L. PHILLIPS, Principal Engineer, Kansas City Power & Light Co, Kansas City, Mo

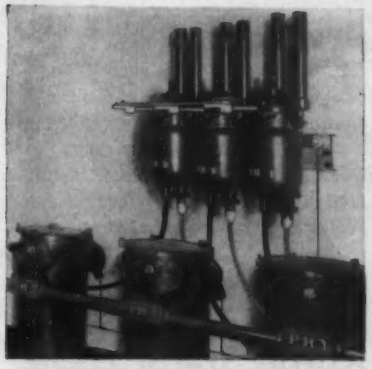
Woven ring-type grips anchored cables against shifting during Kansas City Power & Light Co's construction of five new lines under a new roadway.

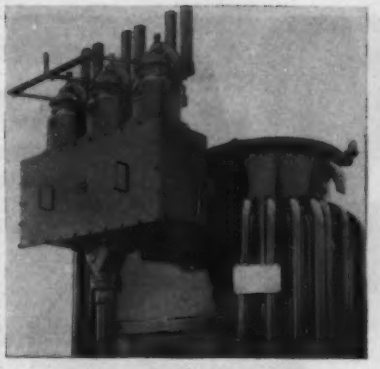
The lines, replacing nine conduit lines from a generating station, cross where there is a cut in the new depressed expressway which traverses the north side of Kansas City. The cut is 350 ft wide and 30 to 35 ft deep.

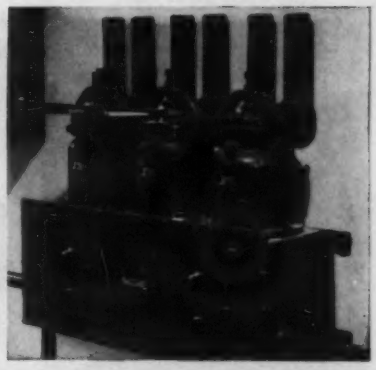
Installation of the new lines posed the problem of how to hold cables so as to prevent them from sinking into the lower manhole. The Kellems grips were installed in the ducts for this purpose on the first crossing.

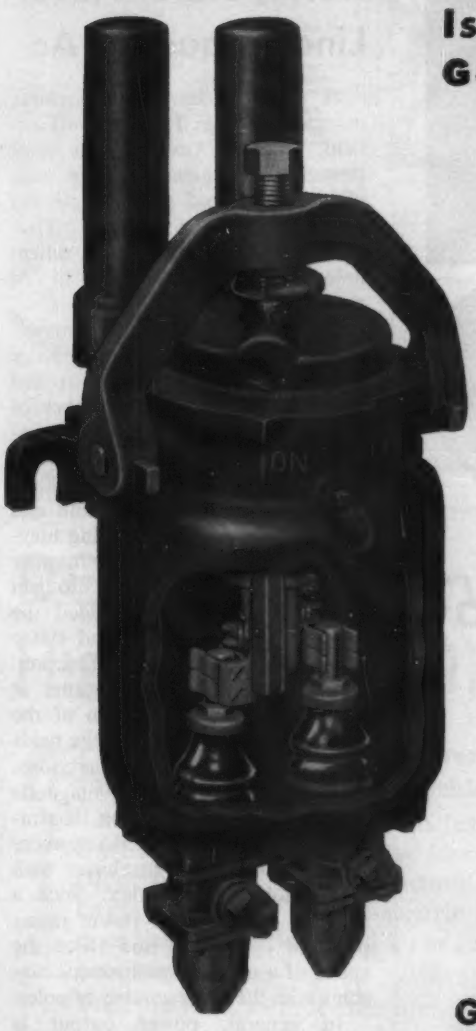
In the other crossings, the cables were anchored in the bottom manhole by means of ring grips which were held in place by pipe flanges. The flanges were on the end of a short pipe nipple anchored in the

(*Continued on page* 102)









Isolate load circuit faults with G&W TYPE "FC" OIL FUSE CUTOUTS

SAFE • RELIABLE • QUIET—No arc flame is ejected from the rugged ALL steel tank.

Type "FC" Oil Fuse Cutouts provide metal enclosed, pressure tight fuse protection for transformers, branch circuits, and industrial services. Within the limits of their short circuit interrupting capacity they are often used in place of more costly protective equipment. They are used to sectionalize circuits under load—a simple gang-operating mechanism adapts them for use as multi-pole oil switches. They are suitable for locations exposed to moisture, corrosive fumes, explosive gases, salt air and flammable dust.

Type "FC" Oil Fuse Cutouts comply with 1953 National Electric Code Section 7144. Inherently explosion proof and requiring a relatively small amount of oil, they are accepted for use in hazardous locations. They may be used without fireproof enclosures in buildings and with dry-type and askarel filled transformers.

Switching contacts are Beryllium copper. Fuse links are simple, inexpensive and easily replaced. Cable entrances are interchangeable—wiping sleeve, stuffing box or porcelain.

Three sizes—	Interrupting capacity per cutout
FC31—2500 volts, 100 amp.	6000 amps. at 2.5 Kv.
FC42—5000 volts, 200 amp.	8000 amp. at 5 Kv.*
FC61—8000 volts, 100 amp.	5000 amps. at 8 Kv.

*Fuses 100 amp. or below—16000 amp. at 2500 volts.
*Fuses above 100 amp.—12000 amp. at 2500 volts.

WELDED STEEL BOXES with Type "FC" Oil Fuse Cutouts

Welded steel boxes enclose and protect the connections of 3/c cables or cables in conduit to gang operated oil fuse cutouts mounted on top of box. The insulated conductors terminate in cutout porcelain bushings extending down into the box. Cable entrances, wiping sleeve or stuffing box (and conduit fittings when required) can be located on either end or on bottom of box.

Send For Bulletin CB56

G&W ELECTRIC SPECIALTY COMPANY
3500 W. 127th ST., BLUE ISLAND, ILLINOIS

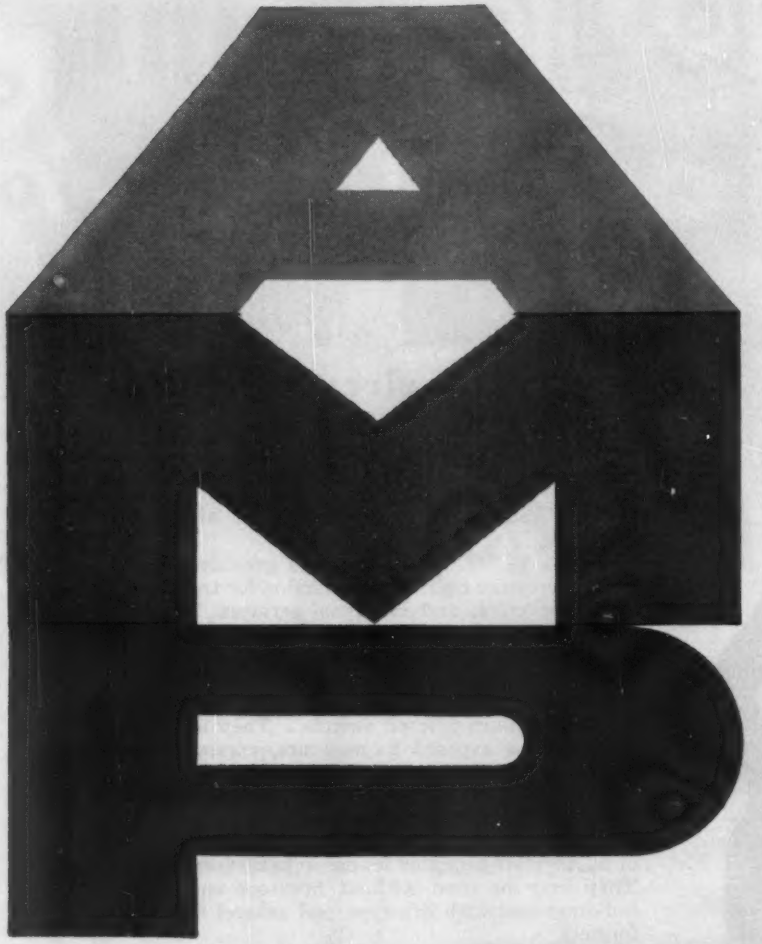
C571

Representatives in many cities of U. S. A., N. & S. America — Canadian Mfr. — Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

G&W

High Voltage Cable Terminating, Sectionalizing, Protecting, and Connecting Devices

POTHEADS • BOXES • OIL FUSE CUTOUTS • LOAD BREAK OIL SWITCHES • SPLICING KITS



WE'VE GROWN ACCUSTOMED TO

taking off in a plane . . . boarding a train . . . embarking on a ship . . . flipping a switch . . . turning a dial . . . pressing a button. We've grown accustomed to all the improvements and advantages electricity provides industrially and in our homes. We rely on them.

Yet this network of essential services cannot be more trustworthy than the terminal attached to the end of a wire.

A-MP solderless terminals have been designed and developed to meet the specific wiring requirements of electrical motivation, whenever and wherever it is generated, distributed, utilized or maintained.

Proven by use, A-MP termination is accustomed to increasing production volume, lowering manufacturing costs, improving the product's quality and efficiency.

Depend on A-MP termination, because you can.

The brochure "Molto Allegro" illustrating the scope of the AMP Organization and variety of A-MP wire termination will be sent on request.

AMP INCORPORATED

GENERAL OFFICES:

7228 Eisenhower Boulevard, Harrisburg, Pa.

Wholly Owned Subsidiaries: Aircraft-Marine Products of Canada Ltd., Toronto, Canada • Aircraft-Marine Products (Great Britain) Ltd., London, England • Societe AMP de France, Le Pre St. Gervais, Seine, France • AMP—Holland N.V. 's-Hertogenbosch, Holland.

Distributor in Japan: Oriental Terminal Products Co., Ltd , Tokyo, Japan.

AMP AMP AMP AMP

Grip Anchors Cable

(*Continued from page* 100)

manhole wall. This arrangement confined all cable in the duct.

Lead sheaths in the first installation are in tension; those in later installations are in compression.

NEW DESIGN TRENDS

Rotor, Stator Have Line-Frequency Ac

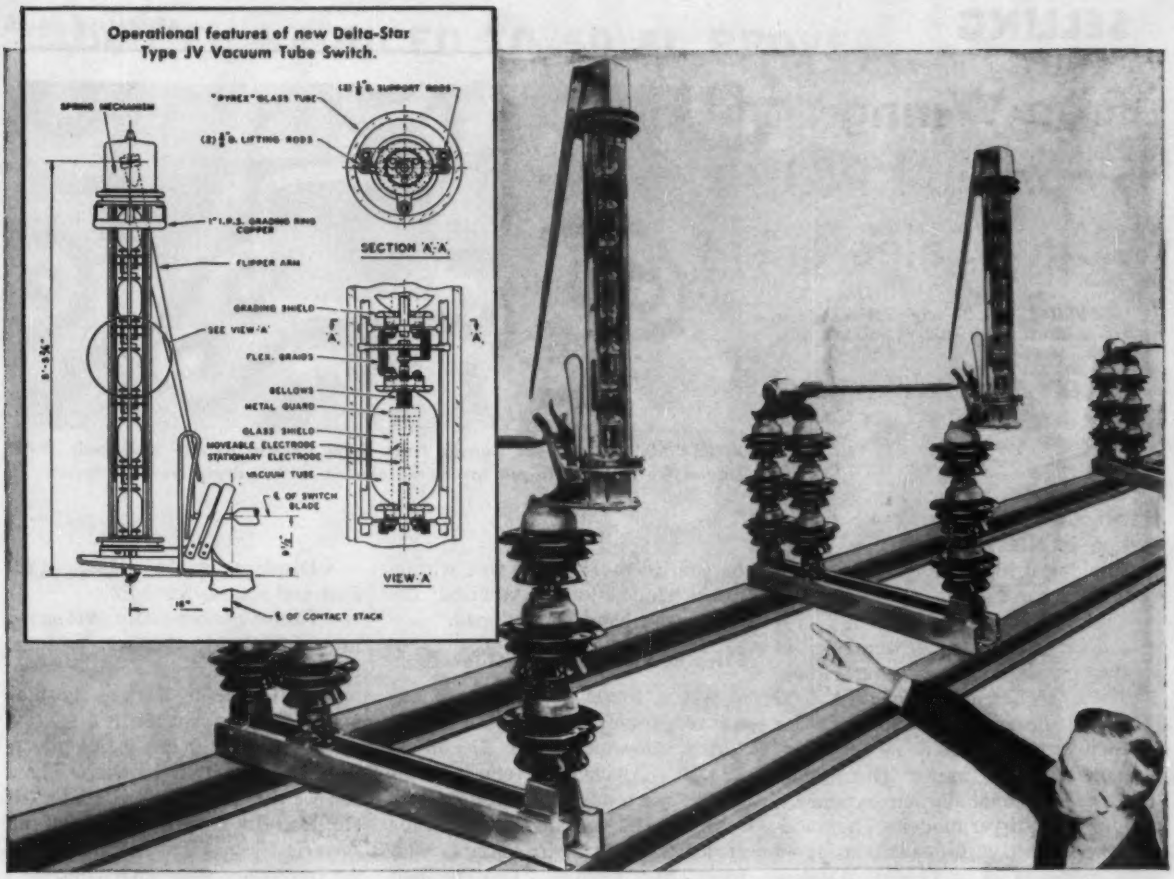
A rotary synchronous machine, invented by G. F. Flanagan of Fairfield, Victoria, Australia, has ac of power-line frequency in the coils of both rotor and stator, McGraw-Hill World News reports. Thus the machine has no need for salient poles, permanent magnets, or dc excitation.

This machine, not yet in commercial production, operates at twice the rotational speed of a dc-excited machine with an equal number of poles and operating at the same frequency. The design permits an increased power rating for a machine.

Rotor and stator are wound and connected to produce rotating magnetic fields having the same number of poles. Thus rotor synchronism occurs at zero rpm, provided the magnetic fields of rotor and stator are rotating in the same direction. Rotor synchronism also occurs at twice the speed of rotation of the stator magnetic field when the fields are rotating in opposite directions.

The machine, whose magnetic fields of rotor and stator contrarotate, thus resembles two conventional synchronous machines with a common magnetic flux. Such a machine has a higher power rating per unit of volume and twice the speed of a normal synchronous machine with the same number of poles.

In general, power output is limited by the cooling available for a machine's windings. As all ac flows in the stator of a conventional synchronous machine and only a small exciting current in the rotor, the new machine's ac losses are shared equally by rotor and stator. Accordingly, its power per unit volume rating is nearly double that of a dc-excited machine.



DELTA-STAR Announces NEW High Voltage MKV-40 Interrupter Switch

Provides positive current interruption for load and capacitor switching.

The new Delta-Star MKV-40 Interrupter Switch is especially well suited for switching capacitive loads. A series of vacuum switches having extremely high dielectric strength does the job. Ratings 34.5 kv to 138 kv are now available.

Vacuum switches are in the circuit only during the interrupting cycle. Interruption occurs at first current zero with no restrikes. Jennings vacuum switches used in this device require no maintenance.

Get all the facts about this new Delta-Star switch from your nearest representative. Or, write *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton St., Chicago 12, Ill. Offices in principal cities.*

HKP DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.

Divisions of H. K. Porter Company, Inc. are: Alloy Metal Wire, Connors Steel, Delta-Star Electric, Henry Disston, Laclede-Christy, Leschen Wire Rope, McLain Fire Brick, Quaker Pioneer Rubber, Quaker Rubber, Riverside Metal, Vulcan Crucible Steel, W-S Fittings.

Free Wiring Peps Up KP&L Dryer Sales

LEE NICHOLSON, Director of New Business, Kansas Power & Light Co, Topeka, Kan.

ANIMATED DISPLAYS at Kansas Fairs drew visitors by the thousands. KP&L staged the displays to put across the electric clothes dryer story en masse

Free wiring and heavy promotion by Kansas Power & Light Co, and the dealers and distributors in our area sold 2,501 electric clothes dryers during a recent 14-week campaign. This boosted dryer saturation in KP&L territory by 1.7%, bringing it to 9% in a highly competitive gas area.

Here's how it was done . . .

First, dealers made the offer of free installation of a dryer circuit. Then we offered the dealer a $10.00 wiring promotional allowance for each dryer installed in the company's service area. Distributors made additional allowances depending on the dryer model. The maximum circuit wiring cost considered normal was set at $32.00. Dealers shouldered the cost not covered by us and distributor in varying amounts up to this figure. Dealers handled installation arrangements.

This might look tough on the dealer, but it was easier on him than it appears at first, because:

- Many dryers were sold in new homes in which dryer outlets had been included by the builder.
- By having the dealer offer a bargain in the form of free wiring, prices tended to be stabilized; the customer's hand was "tipped."

Extra Service Entrance Offer

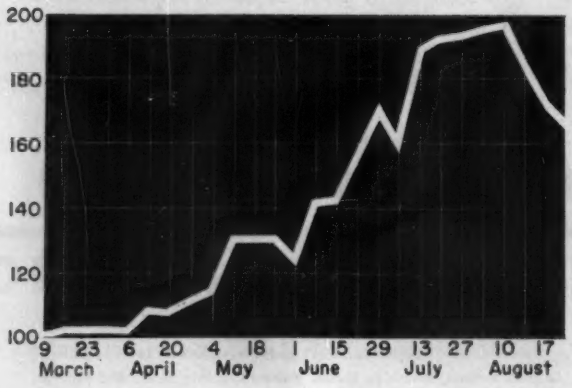
Where there was a service entrance problem, we increased our wiring allowance from $10.00 to $33.00, provided the entrance installed had a minimum Housepower rating of 100 amp and provision for at least eight 2-wire circuits and four 220-v circuits. Dealers then offered up to $55.00 on the service entrance and dryer circuits, to help the customer with his Housepower problem. Eighteen percent of the customers took advantage of this, leaving the door wide open in 499 homes for future sales of ranges, air conditioners and other equipment.

KP&L backed the offer with an aggressive consumer advertising program, which included:

- Displays at the Kansas Free Fair and Kansas State Fair.
- Twelve-minute marionette shows in which Reddy Kilowatt told the electric clothes dryer story.
- Dealer tie-in sections in nine major daily newspapers.
- Over 30,000 col in. of advertising in 109 area papers. These ads were slanted toward EEI's "If He Had to Do It—He'd Get an Electric Clothes Dryer" theme and the free installation sales clincher.
- 814 radio spots on 11 area stations plus numerous spots on TV.
- Helping dealers set up laundry displays. We gave them a large, multi-colored "free installation" banner and a 14-piece EEI kit.

The dryer promotion not only created a great deal of customer interest, but it gave our dealers a shot in the arm with a no-trade-in deal on a low service appliance.

Norge Sees Climbing Curve for Retail Refrigerator Sales



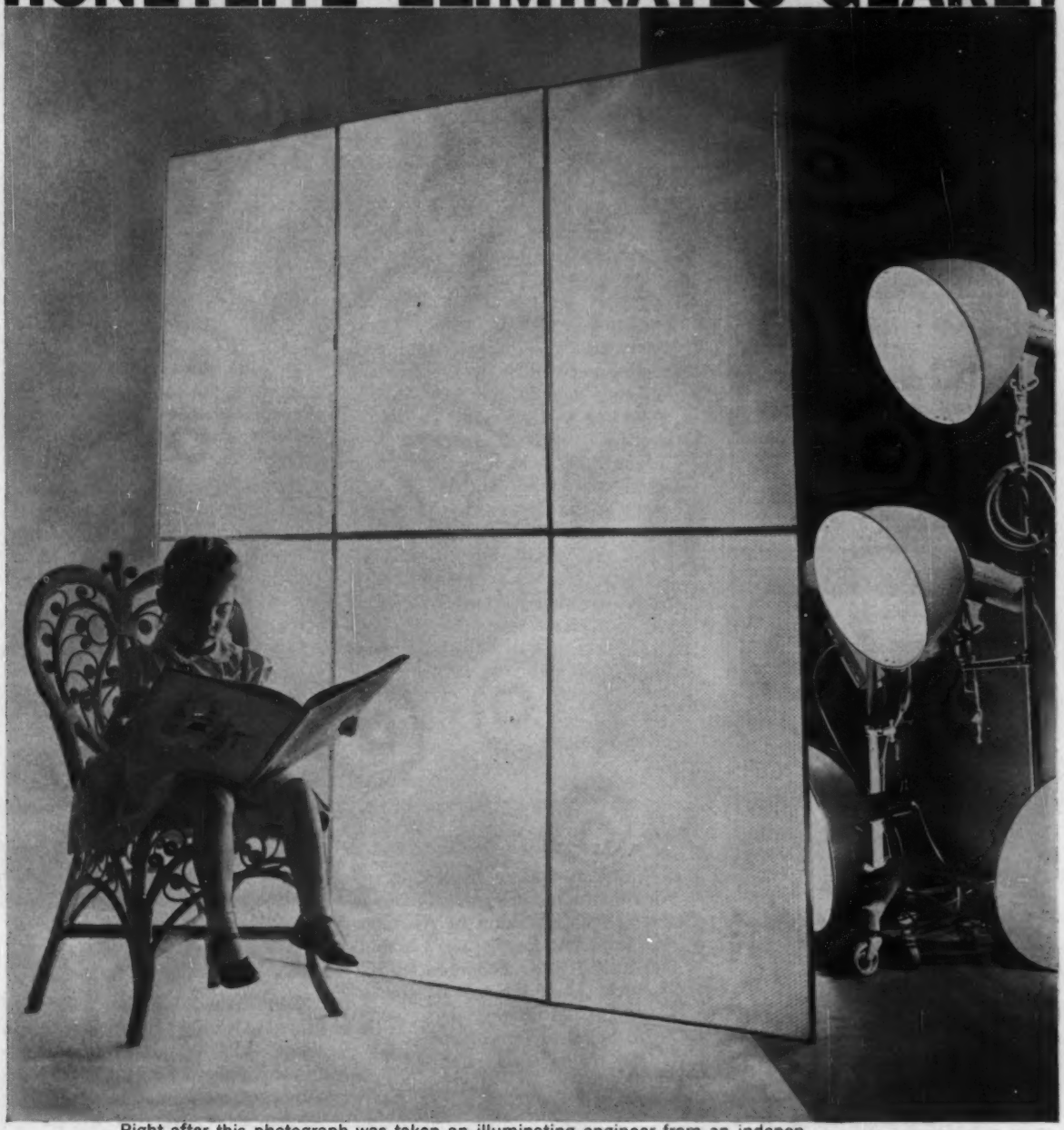
Norge Division of Borg-Warner Corp has come up with this interesting retail sales curve for refrigerators. It's based on the market's 1955-56 figures.

Using the number of units sold during the week ending March 9th as a 100-unit base, you can see the curve remained flat at the 101 level until April 6th, when it started upward to 108 for April 13th. The peak for the retail refrigerator season should come near the middle of August, if the curve is correct. The peak is predicted at 196 units, or almost twice the number sold for the base week of March 9th.

(More Selling on page 106)

20,000 FL* REDUCED TO 50 FL PROVES

HONEYLITE® ELIMINATES GLARE!



Right after this photograph was taken an illuminating engineer from an independent laboratory took Footlambert readings. His findings are as follows: each of the battery of photographer's floodlights produced 20,000 FL; the six Honeylite panels gave overall 340 FL readings; the little girl's face showed 120 FL; and the page in her picture book was all the way down to 50 FL . . . a light soft enough for the youngest eyes!

HONEYLITE®

LIGHT-DIFFUSING ALUMINUM HONEYCOMB

A DEVELOPMENT OF HEXCEL PRODUCTS INC.

951-61ST STREET, OAKLAND 8, CALIFORNIA

See our Catalog in Sweet's file 31a/He

* Footlambert—the standard unit of surface brightness—as measured with a Spectra Brightness Spot Meter. Name of testing laboratory available on request.

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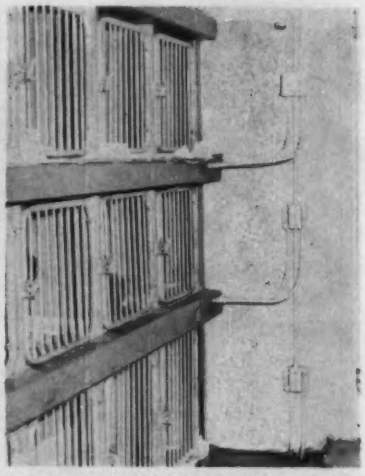
Electric Heat 'Goes to the Dogs' in California

A dog's life isn't so bad . . . not when there's electric heat in it, anyway. Carmicheal Animal Clinic in Sacramento, Cal., is using electric heating cable in the floors of its hospital ward cages to keep the animals warm and comfortable.

And benefits are many. Post-operative complications, such as pneumonia, are cut down; clean, even heat is provided where it's needed most—next to the animals; and the "patients" are kept quieter, according to Dr Leland Bell, Carmicheal's owner-designer.

The clinic, served by Sacramento Municipal Utility District, has 24 cages in the dog ward. These are arranged in tiers (see illustration). Each tier is separately heated by a 180-w, lead covered, soil heating cable in conduit embedded in concrete. There is also a cat ward with ten smaller cages. Because cable in these cages had to be installed with sharp bends in it, Leland used plastic-covered, 400-w soil heating cable imbedded directly in the concrete.



DOG WARD has individually controlled heating cables in concrete floors of cages for dogs' warmth and comfort

Total connected load is 1.3 kw; monthly use varies between 540 and 700 kwhr.

The dog ward is also equipped with a deodorizing lamp, fluorescent lighting, and an electric exhaust fan.

H & C BRIEFS

New Word—Same Comfort

American Society of Heating and Air Conditioning Engineers recently changed its definition of Air Conditioning by adding the word "simultaneously." New definition reads:

> "Air Conditioning is the process of treating air so as to control *simultaneously* its temperature, humidity, cleanliness and distribution to meet the requirements of a conditioned space."

Spring Gives Big Cooling Saving

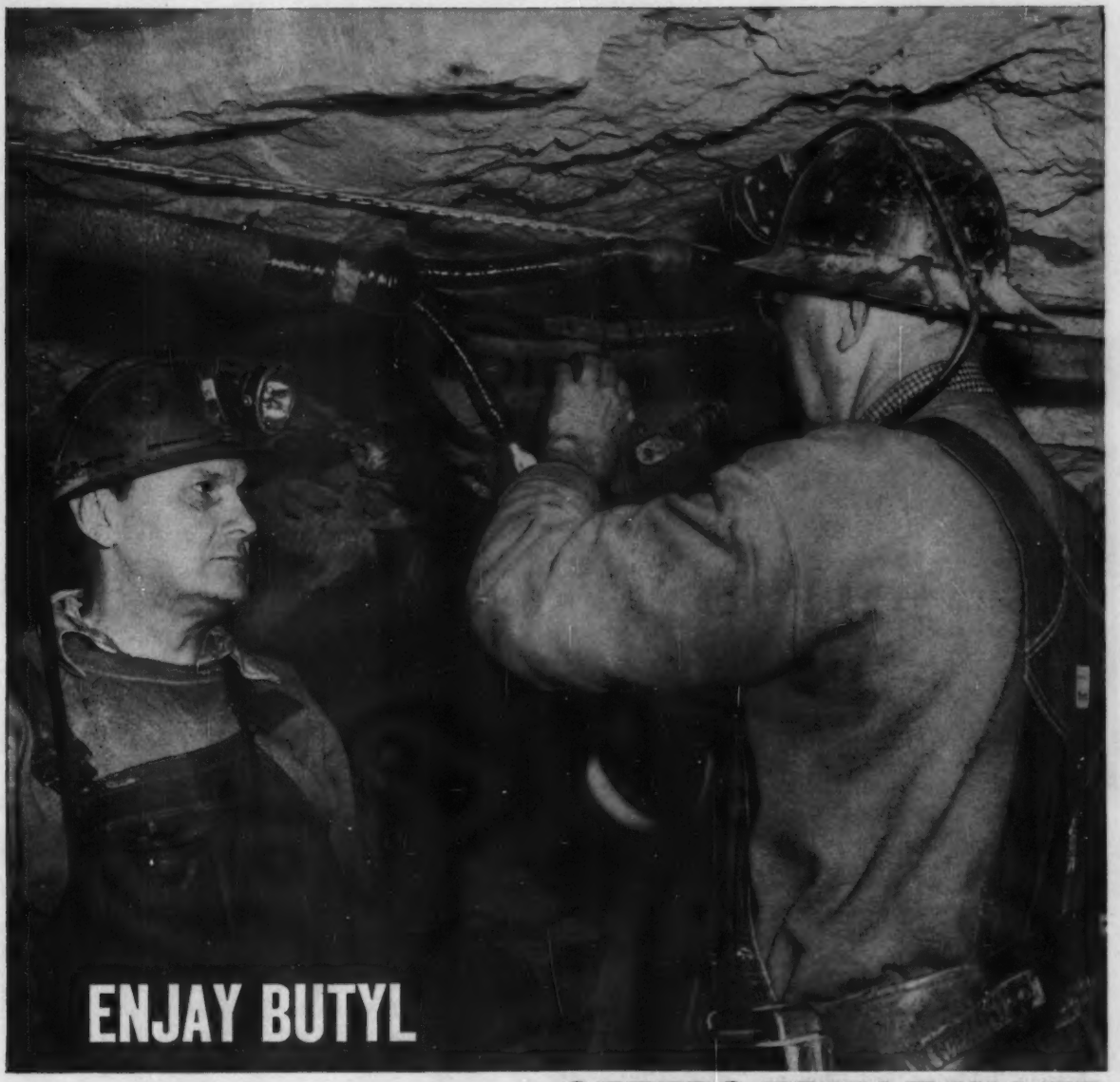
"Big Spring," in Huntsville, Ala., one of the largest natural springs on earth, is providing a saving of $25 a ton on an air conditioning system for a new $1¼ million Electric Service Center in that city. With a daily flow of about 24 million gal at 60-62 F, which is lower then the water temperatures available in most cities, the spring will affect the savings in both equipment and operating costs.

Lilco's 'Coolerama'

Long Island Lighting Co's third annual "Coolerama" packed in about 15,000 air conditioning-minded souls this year. Solid company promotion in all media put the six-day show over. Lilco pushes air conditioning because the company peaks in winter, and expects to do so for a long time to come.

More than 25 manufacturers of all kinds of air conditioning systems, from room units to central office building installations, were represented. Several had equipment hooked up.

(*More Selling on page* 108)



electrical wonder rubber OFFERS TRIPLE VALUE

Performance! Versatility! Economy! In all three, Enjay Butyl is the world's outstanding rubber value. In laboratory tests, and a wide variety of applications, no other rubber has matched Enjay Butyl's ability to resist ozone and corona, impact and abrasion, moisture and weathering . . . properties that make Enjay Butyl-made products *outstanding* performers.

Underground service cables, transformer housings, high-voltage industrial cables . . . in these, and many other electrical applications, Enjay Butyl outperforms and out-lasts *all other* types of rubber, synthetic *or* natural. *Low-in-cost* and *immediately available*, this truly wonder rubber may well be able to cut costs and improve performance in *your* products. For further information, and for expert technical assistance, contact the Enjay Company.

ENJAY

Pioneer in Petrochemicals

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.

Other offices: Akron • Boston • Chicago • Los Angeles • New Orleans • Tulsa

ENJAY BUTYL

Enjay Butyl is the greatest rubber value in the world . . . the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

100-foot-candle lighting, plug-in bus duct distribution . . .

Boost Production and System Flexibility

W. L. STREICH, Commercial Sales Representative, Wisconsin Electric Power Co, Milwaukee, Wis.

Increased production, improved employee morale, and greater flexibility to meet production changes are the principal benefits from a new lighting and low voltage distribution system installed by Lucas-Milhaupt Engineering Co, of Cudahy, Wis., manufacturers of brazing, soldering, and alloy preforms. The new plug-in bus duct distribution system boosts the service capacity from 100 amp to 200 amp. Now, when new orders are received, the machines can be shifted from one location to another in a matter of minutes. Savings in time and money are an extra bonus to the company.

At the same time, the lighting level was raised from 30 to 100 ft-candles in the shop and from 50 to 200 ft-candles in the office, with improved efficiency in both areas as a consequence.

The changes were part of a remodelling program that doubled the production area. The bus duct installation includes one line down the center of the shop and one at each end. Each motor is fused with a time delay fuse installed in the connecting cap at the end of the four-wire power cable. Using this system, each machine is grounded and each has its own fuse protection.

Lucas-Milhaupt's load consists principally of small, integral horsepower motors, ranging from ½ to five hp in rating. Distribution voltage is 240 volts. Total connected load on the new distribution system is approximately 55 hp.

Before the new system was installed, all motors were connected permanently. When a new order was received, the permanent connections had to be taken off and the machines rewired at the new location. This operation required a considerable amount of time in addition to being costly.

FACTORY OFFICE NOW HAS 200-foot-candle illumination, four times the previous lighting level. Employees like new lighting, production is up

CUSTOM-DESIGNED CONTROL CONSOLES, like this one, place complete control at the operator's fingertips. He can set low and high limits . . . schedules . . . choose fringe or fringe-plus-sustained control action . . . take over on manual control in an instant. On station control consoles, he can set up incremental loading schedules for individual generators, based on cost-loading curves. Literally unlimited variations are possible, depending on the requirements of the particular installation.

NEW! electronic control for system load and frequency

HERE'S the fast, accurate Honeywell all-electronic way to regulate network interchange . . . system load dispatching . . . generation of individual units in stations. Engineered and built by Honeywell, this new type of control uses highly stable, dependable servo circuits.

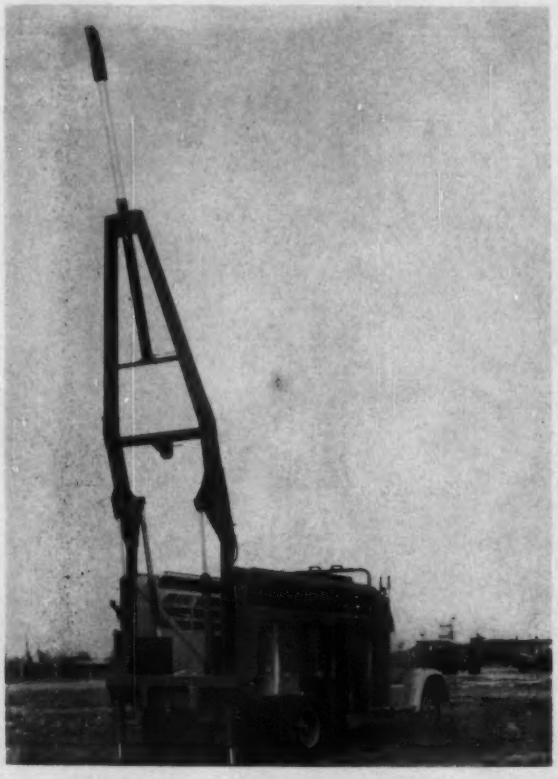
Honeywell's load and frequency control system includes continuous, high-speed telemetering using distortion-proof pulse rate transmission. A single channel is usually all that is needed for control of each station. Area and net power totalizing is done rapidly and accurately by electronic circuits.

Control is designed to provide maximum economy of system operation and to accurately maintain schedules. Unitized components simplify the initial installation . . . make expansion easy.

Ask your Honeywell sales engineer to discuss your system's requirements...he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls



Derrick

This two-legged hydraulic derrick reportedly can lift heavy loads in low ranges, has a body loading capacity up to 4,000 lb, and can use power feed attachments for digger. Known as the Series 6800, it has a double-acting cylinder which functions as an extendible boom head to extend head an extra 5 ft.

With boom head extended, it reportedly handles poles up to 75 ft long without sacrificing lifting capacity. Reported capacities with boom head 10 deg beyond vertical are 3 tons with boom head extended, 4 tons with head retracted. Two single-acting auxiliary cylinders move derrick to within 10 deg of vertical; two main, double-acting cylinders take over when more leverage is needed.

Three sets of hydraulic levers, located in cab, rear, or side compartment, control all lift and boom head cylinders.

J. C. Holan Corp, 4100 W. 150th St, Cleveland 11, Ohio

Distribution Transformer

Intended for indoor use or outdoor use, these totally sealed dry-type distribution transformers use Class H insulation throughout and are said to have lower size and weight per kva. For all standard voltages through 600 v, the series includes single-phase, 60-cps ratings of 5, 7.5, and 10 kva, and 3-phase, 60-cps ratings of 9 and 15 kva.

Other features reported include large wiring compartment, knockouts on back, side, and bottom, solderless clamp-type connectors on a rigid insulating board.

Acme Electric Corp, Cuba, N. Y.

Insulating Handles

Insulating handles known as HH5 Hotsticks are available to adapt the Y35 Hypress hydraulic tool for hot-line work. The Hypress is used to install compression connectors on aluminum, copper and ACSR cable. Hotsticks are interchangeable with the standard handles, without special tools.

Design is said to shorten the over-all length of the assembly without decreasing length of the insulating handle. Shotgun-type control allows lineman to release connector without taking hands off handles. Rubber guards keep hands from sliding up the handle.

Burndy Corp, Norwalk, Conn.

Switchboard

A standardized, 14-in. deep switchboard line, designated as the Series 1 Power-Style and reported to be completely front accessible, is available for service from 400 to 2,000 amp. A variety of standard current transformer compartments is available in either hot or cold sequence with main breaker or main switch. Sections can be supplied with up to six breakers or six switches without a main disconnect where local codes permit.

Switchboards may be fed by cable or bus duct. Distribution sections, incorporating molded case breakers or switches, can be connected by cable or standard horizontal bus.

Square D Co, 6060 Rivard St, Detroit 11, Mich.

Cable Clamps

These cable clamps, known as the 480 Series, have no nuts and reportedly can be applied without being disassembled. According to manufacturer, universal, parallel groove design permits three clamps to cover range from No. 2 to 397.5 Mcm in ACSR and from No. 2 to 400 Mcm in stranded aluminum conductor.

Top and bottom parts are alumi-

(Continued on page 115)

HOME BUILDING IN DALLAS BOOMS RESIDENTIAL LOAD

DISTRIBUTION TRENDS REPORT:

Dallas Power & Light meets challenge of air conditioning load growth

In the last ten years the City of Dallas has extended its city limits to encompass more than two and one-half times its previous area. And, according to forecasters, by 1960 Dallas will require seven times the electric power used a decade ago. In line with this trend, Dallas Power & Light Company's generating capacity rose from 118,000 kw in 1946 to 837,000 kw today, and will increase to 1,137,000 kw by 1960.

These few facts point up a spectacular load growth. The rapid increase of air conditioning load has added to the problem created by the extreme pace of this growth. Dallas P&L was faced with a rising cost of installing a kilowatt of distribution system capacity. This posed a problem for DP&L distribution planners.

MORE POWER TO AMERICA

GENERAL ELECTRIC

Here's how General Electric helped DP&L meet this challenge

DISTRIBUTION TRENDS REPORT:

Sound planning, move to 138 kv transmission, use of capacitors, and flexible substations enable DP&L to meet growth economically

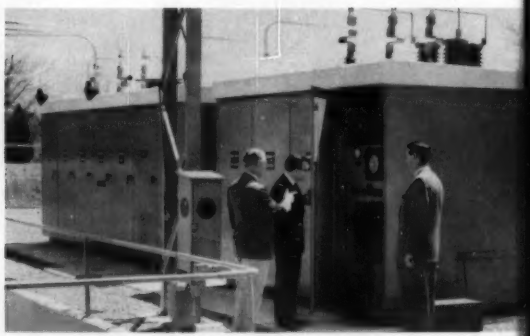
EFFICIENT CLUSTER MOUNTING of 24 G-E 25-kvar capacitors allows more capacitors on pole, contributes to DP&L's high ratio of kvars/kilowatts. Discussing capacitor performance are L. H. Cardwell, DP&L Operating Division Head and G-E Sales Engineer, B. T. Bain.

Dallas Power & Light first implemented a plan in 1937 that treated transmission and distribution integrally, allowing great flexibility for future growth. In recent years the problems of increasing seasonal load and higher construction and operation costs have added new importance to their transmission-distribution practices. Sound planning has enabled DP&L to minimize capital expenditures and operating costs while cultivating loads to improve load factor.

HOW THE PLAN WORKS:

Long Range Planning — Plans are projected in 10 to 15 year periods. DP&L considers generation, transmission and substation facilities for serving a load of three to four times that currently served. Actual load growth and other considerations require that long-range plans be reviewed periodically and revised to fit changing conditions. Flexibility and expansibility underlie all of Dallas Power & Light's programs to stay ahead of rising load.

HIGHER TRANSMISSION VOLTAGE — A large section of the 69 kv transmission ring encircling Dallas is now being converted to the more economical 138 kv. As new generating capacity and load require, the higher voltage will be used on the entire ring. Distribution voltage, except in the City's heart, has long been standardized at 13 kv, and a 13 kv overhead system now serves 93% of the service area.



FLEXIBILITY to meet load growth is provided by this all-General Electric substation, rated 25,000 kva, recently installed by DP&L. Examining it are (l.) DP&L's F. J. Zak, Senior Engr., and (r.) J. P. Barron, Div. Head, Substation and Transmission Engineering and G.E.'s B. T. Bain.

METER ACCURACY is essential to operating revenue. These General Electric single-phase, type I-55 watthour meters are factory certified for accuracy. V. P. Armour (r.), Meter Div. Head, and M. B. Donegan, Supvr. Meter Laboratory, both of DP&L, inspect an apartment house installation.

MORE KVARS — DP&L was one of the first utilities to recognize the importance of capacitors, and now the system has 356,000 kvar of capacitors or more than 0.5 kvar per kilowatt of demand. This is a much higher than average ratio of kvars to kilowatts, and DP&L relies heavily on General Electric capacitors for this favorable ratio. Other General Electric equipment employed includes distribution transformers, regulators, meters, lightning arresters, and streetlighting luminaires.

FLEXIBLE SUBSTATIONS — A basic substation is utilized and includes four 13-kv feeders, each with a normal capacity of 6250 kva. The station design allows expansion to an eight-feeder, 50,000-kva station. This has been adopted by DP&L planners as a basic building block for their distribution system over a wide range of load densities. General Electric engineers helped determine the substation relaying schemes.

When You Specify General Electric, you take advantage of the latest advances in apparatus design, construction, application, and the assistance of complete engineering services. To help utilities keep service running smoothly, highly trained General Electric service engineers plus a network of Service Shops stand ready to meet any and all maintenance and repair needs — day and night.

For Full Information on distribution equipment and Distribution System Services, contact your local General Electric Apparatus Sales Office. General Electric Company, Schenectady 5, N. Y.

LANDSCAPED SUBSTATION is good public relations. L. to r., DP&L's J. P. Barron, Div. Head, Substation and Transmission, and R. D. Elliott, Vice President and Consulting Engineer, discuss new substation layout with G.E.'s District Mgr. — Application Engineering, G. N. Pingree, and DP&L Chief Engr., E. W. Rogers.

NEW STREETLIGHTING for Dallas' Municipal Auditorium is provided by General Electric Form 406 fluorescent luminaires. Standing before the building (under construction) are J. W. Monk, Supervisor of Public Utilities, City of Dallas, and T. C. Winter, Asst. Commercial Manager, Dallas Power & Light Company.

MORE POWER TO AMERICA

GENERAL ELECTRIC

Here's why it pays to see General Electric about your distribution problems

DISTRIBUTION TRENDS REPORT:

Dallas P&L to help test experimental General Electric distribution transformers

Dallas Power & Light Company is one of several utilities that have recently agreed to install General Electric experimental distribution transformers. Through its willingness to try new designs and participate in co-operative testing, DP&L places itself in the ranks of utilities taking advantage of the most advanced designs originating with General Electric product development.

These new transformers represent a highly significant step forward toward reducing maintenance and increasing transformer life. They use molded transformer covers and molded transformer bushings. The molding material is an outgrowth of General Electric's development of molding materials resistant to arc tracking, first introduced by General Electric in the late nineteen forties for instrument transformers. Use of the new cover should reduce outages caused by squirrels and birds and, as it needs no painting, should keep factory-fresh indefinitely. This typifies the manner in which product development at General Electric strives to anticipate and meet tomorrow's operating needs — today.

When you specify General Electric, you get the result of General Electric Distribution System Services which include headquarters system planners — district application engineers and product specialists — extensive product development facilities — equipment installation and field service engineering.

These services offer assurance of maximum operating continuity, on-the-spot application help, equipment efficiencies, valuable help in system design and techniques. Get the full story from your General Electric Apparatus Sales Office. General Electric Company, Schenectady 5, N. Y.

LIVE BETTER ELECTRICALLY

303-6

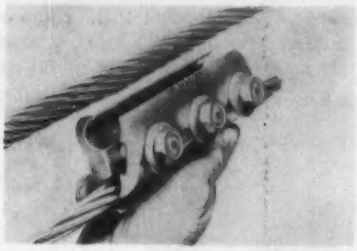
LONGER LIFE and a reduction in costly service trips are expected to be proven by DP&L—G.E. tests on General Electric's new experimental distribution transformers. Here, Distribution Transformer Dept.'s M. Broverman, Mgr. Design Engineering (l.) and W. A. McMorris, Mgr. Advanced Product Engineering examine molded parts.

MORE POWER TO AMERICA

GENERAL ELECTRIC

Cable Clamps

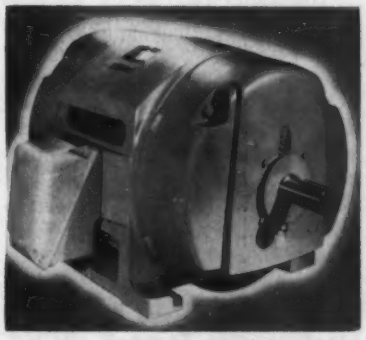
(Continued from page 110)



num alloy extrusions. Bolts are anodized to reduce thread friction. Clamps are said to have withstood 200 F without significant change in connection resistance and to have undergone 1,000 heat cycles using various conductor combinations.
Aluminum Co of America, 1501 Alcoa Bldg, Pittsburgh 19, Pa.

Trough Tee

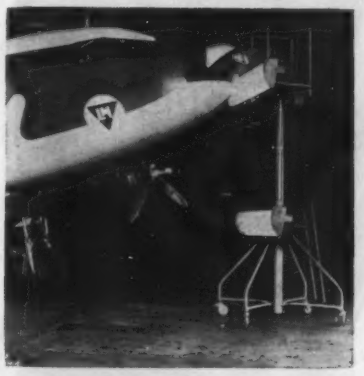
This vertical tee fitting provides continuous metallic contact between vertical and horizontal cable trough runs. Cables in a vertical run can be dropped in either direction into horizontal runs. It reportedly protects both cables changing from a horizontal to a vertical run and other cables continuing their horizontal run.
T. J. Cope, Inc, Third & Walnut St, Collegeville, Pa.



Redesigned Motors

This redesigned line of a-c induction motors is built to standards suggested by NEMA. It has increased hp for a given frame size. Known as the Tri-Clad 55 line, it is reported to average 20% lighter than its predecessor, with weight savings of 100 to 500 lb per motor. Size reduction for comparable hp-ratings reportedly average 27%. Reductions result from improved insulation.

The line includes motors rated 40 to 125 hp in frames sizes from 364U to 445U. Both open, drip-proof model (illustrated) and totally-enclosed, fan-cooled model are available. Other reported features are lower noise level and reduced maintenance.
General Electric Co, Schenectady 5, N. Y.



Maintenance Platform

Designed for maintenance applications, this portable structure has integral fluorescent lighting and a hydraulically controlled, electrically or manually operated platform. Height of the 30 x 30-in. platform is adjustable from seven to 17 ft. Two 2-lamp luminaires provide maximum light in one direction of 40,000 lumens.

Unit includes 250-ft reel of cable with grounding conductor and outlets for power tools. All electrical components operate at 120 v.
Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

Contact Material

Known as Ventureloy II, this silver alloy reportedly has a conductivity of at least 75% IACS and a tensile strength and hardness greater than coin or sterling silver. It is said to take high current loads, high frequencies of operation, and great contact forces. Manufacturer claims it can be cast, drawn, rolled, or formed by conventional methods.
Venture Corp, 30 Fulton St, Newark, N. J.

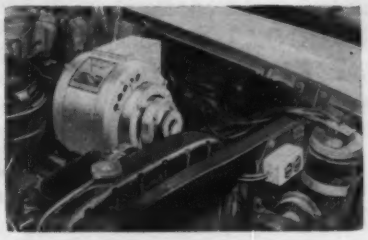
Motor Control Centers

Available with single or double front and single or double bus, these motor control centers combine motor control, motor protection, and circuit protection devices in a single metal enclosure. Units may be made for indoor, dust-tight, or weather-proof use.

Main bus is located in the center of the structure; this is said to reduce current density and heat build-up in the vertical bus. Horizontal bus is rated 600 amp; vertical bus risers, 300 amp. The entire bus system is reportedly braced to withstand 25,000 amp rms short-circuit current. Three types of wiring are offered: NEMA Type A, without terminal blocks; Type B, blocks in individual units; Type C, completely wired to master blocks.
Nelson Electric Manufacturing Co, 4041 S. Sheridan Rd, Tulsa, Okla.

Increment-Start Motors

Increment-start, 4-pole 1800-rpm motors for operaton at 220 v ac are available in sizes of 20 hp and up. Standard two-step, three-pole general purpose starter is used, with time delay of two to five seconds between the two steps. Manufacturer claims need for expensive, complex switchgear is eliminated and that rotor quickly attains full rated rmp. Motors for 440 v or speeds other than 1800 rpm are built to order.
Brook Motor Corp, 3553 W. Peterson Ave, Chicago 45, Ill.



Truck Generator

Designed for continuous portable auxiliary power and for emergency power during failures, the Electrol GenerAC heavy duty generator provides 115-v a-c, single-phase power for operating motors up to two hp.

(Continued on page 116)

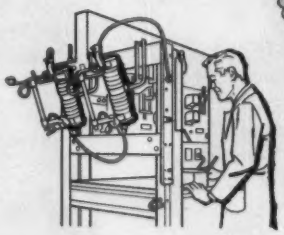
It takes KEARNEY QUALITY in Fuse Links

to give you maximum service continuity

Strictest quality control . . . from design through final inspection . . . guarantees that all KEARNEY Fuse Links of the same rating will perform exactly alike.

ALL KEARNEY Fuse Links feature low temperature operation. Pure tin elements or low melting point solder keep temperatures inside the cutout tube well below charring point. You can be certain of positive arc clearance even after long periods of overload.

Wherever service continuity demands the best . . . in Specialized or Standard Fuse Links . . . the choice is KEARNEY! Contact your KEARNEY Representative.



Extensive, continuing tests made at KEARNEY's own high voltage Sub-station duplicate field conditions; assure fuse link accuracy.

377

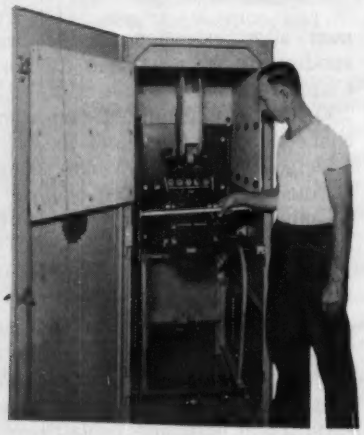
JAMES R. KEARNEY CORPORATION, *General Offices:* 4224-42 Clayton Ave., St. Louis 10, Mo.

for BETTER CONSTRUCTION SAFER MAINTENANCE *Specify* KEARNEY PRODUCTS

Plants at: ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IA. — GUELPH, ONT., CAN.

The unit has an electric clutch and is coupled by a belt drive to a truck or tractor engine crankshaft pulley. Unit control panel is mounted below the instrument panel of the truck or tractor. Model CD-3500, shown above, provides 3,500 w of 60-cps power; the CD-1500 is rated 1500 w.

Electric Controls, Inc, Wales, Wis.



Drawout Breaker

The MC-6 drawout breaker, designed to protect heavy-duty, d-c 125- to 750-v, feeder systems, is said to have a more compact housing and an improved racking mechanism. Unit ratings cover a range of 2,000 to 8,000 amp. Compared to the MC-5, housing width is reduced 2 in., height 14 in.

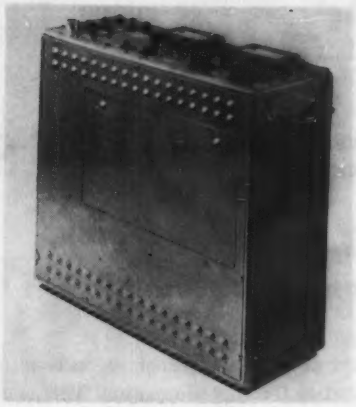
The cam-type racking mechanism has all parts on the breaker truck except two cam pins and their support. Manufacturer claims breaker can be fully connected or disconnected by five strokes of racking handle. New unit is not interchangeable with the earlier MC-5.

General Electric Co, Schenectady 5, N. Y.

Electrostatic Tester

This portable tester uses a Felici electrostatic generator controlled by feedback circuits to assure stable operation. Designed for testing generator windings, it is said to be particularly suited for measuring very small leakage currents in high capacity circuits.

Voltage is adjustable from one to



50,000 v. Maximum current is 0.5 milliamp. Regulation of 0.5 v, voltage drift of 0.1% per hour, and stability of 3 v at full voltage are reported. Equipped with shielded cables and 3-range, microammeter, the set weighs 100 lb, measures 24 in. x 23 in. x 9 in.
Dominique Gignoux, 50 Broadway, New York 4, N. Y.

Air Conditioner

A packaged air conditioner, designed to work as an air-cooled unit in commercial applications, is available for operation on 208, 220, 440, or 550 v ac. Identified as the SAC, the unit has a hermetic air-cooled compressor which eliminates the need for conversion; an air-cooled, weatherproof condenser with high capacity blower and motor; lubricated fan and fan motor bearings; and an automatic temperature control switch.
Worthington Corp, Harrison, N. J.

Centrifugal Pumps

Fractional-hp magnetically driven pumps with no moving parts except a rotor-impeller, are offered for heating and air conditioning fields. Known as Magnaflow, they are available in 1/6, ⅓, or ½-hp models in aluminum, bronze, stainless steel, or cast iron. Sizes include 0.75, 1.0, 1.25, 1.5, and 2.0 in. Manufacturer claims they are suited for handling hazardous fluids, can make a system gas and fluid tight, and maintain postive or negative pressures indefinitely.
Corley Co, Inc, Plainville, Conn.

TYPE "G" TRIPOUT

Fused with standard buttonhead links, the KEARNEY Type "G" will clear the full range of overload and fault currents without the use of special gadgets. To restore the Type "G" to service, only the fuse link needs to be replaced.

Top vent directs expulsion gasses harmlessly away from other live equipment. Cartridge recoil from top gas jet keeps upper contact closed during arc interruption. Patented, full-floating top contact eliminates contact burning, maintains high contact pressure until arc is extinguished and cartridge drops out. Never needs adjusting . . . weather-protected by cast bronze hood.

Contact your KEARNEY Representative for the Type "G" engineered to meet your load and fault conditions *precisely*.

378

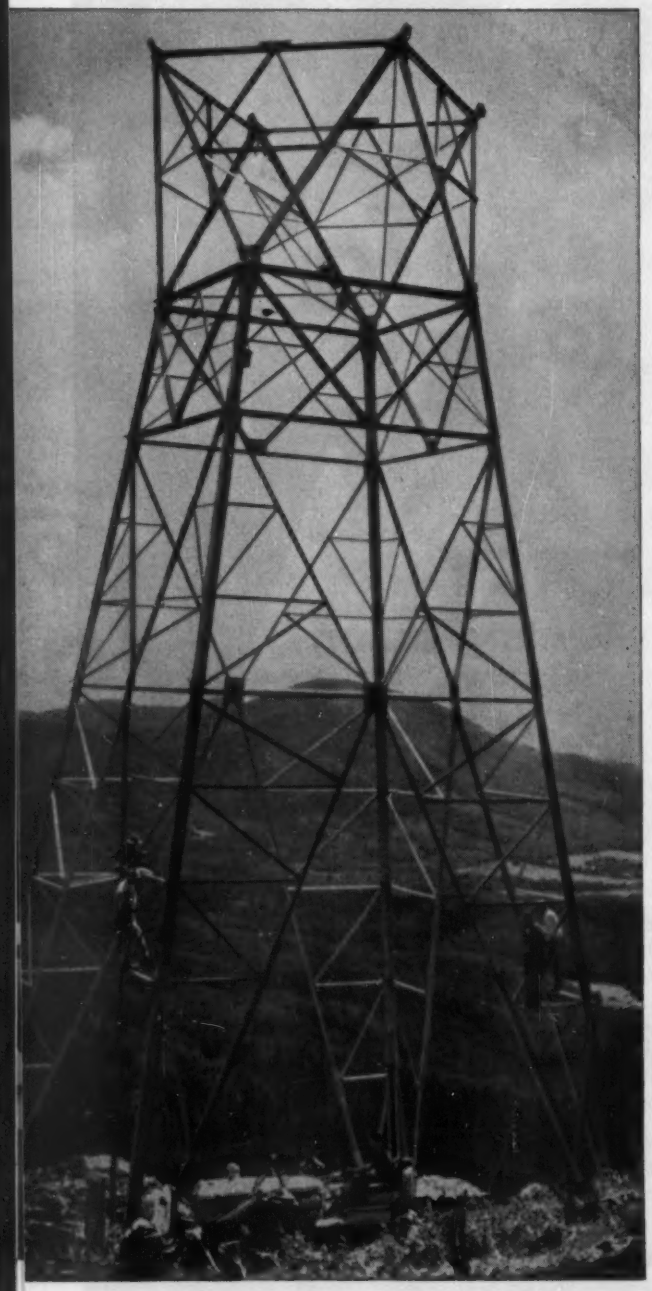
JAMES R. KEARNEY CORPORATION, *General Offices:* **4224-42 Clayton Ave., St. Louis 10, Mo.**

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify **KEARNEY PRODUCTS**

Plants at: ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IA. — GUELPH, ONT., CAN.

By building towers lighter with USS MAN-TEN Steel . . .

You can save on erection costs



—and the tougher the terrain the more you'll save

THE INITIAL COST of steel in a transmission tower is small compared to the cost of erection. This is especially true when your lines run through remote and rugged country. Then, every unnecessary pound of weight takes its toll—makes transportation to the site more difficult and erection more costly.

That's why it's so important to keep tower weight to a minimum.

You can do it safely and at low cost with USS MAN-TEN Steel. Used in the tower legs, cross arms and bracing members under compression, the high yield point (50,000 psi) of USS MAN-TEN Steel makes it possible to materially reduce the size and weight of these parts without any sacrifice of strength and durability.

Despite the fact that USS MAN-TEN Steel is 50% stronger than structural carbon steel, has greater abrasion resistance and has 40% higher fatigue strength, it costs only a little more. That's why its use for reducing weight in tower construction is not only eminently practical but economical as well. That's why USS MAN-TEN Steel is being used in some of the most important power lines in the country.

You will find our 174-page "Design Manual for High Strength Steels" very helpful in applying USS MAN-TEN and our other famous high strength steels, USS COR-TEN and USS TRI-TEN "E," to your designs. For a free copy, write on your company letterhead to United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

GOING UP! Tower assembly and erection are speeded up when weight is kept to a minimum with USS MAN-TEN Steel construction.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS HIGH STRENGTH STEELS

USS MAN-TEN • USS COR-TEN • USS TRI-TEN "E"

UNITED STATES STEEL

7-643

ELECTRICAL BUSINESS OUTLOOK

Electrical World
JUNE 3, 1957

Long-range revenue picture looks good. Population, GNP, industrial, and other forecasts you've been reading buttress this view. Items:

Look for early resumption of long-term growth rate in industrial production. F. Warren Brooks, vice president of finance, Cleveland Electric Illuminating Co, says, "We are optimistic with respect to industrial growth in our national economy and . . . to the potentials of our territory." This was part of his report to visiting financial analysts who toured the CEI Eastlake plant.

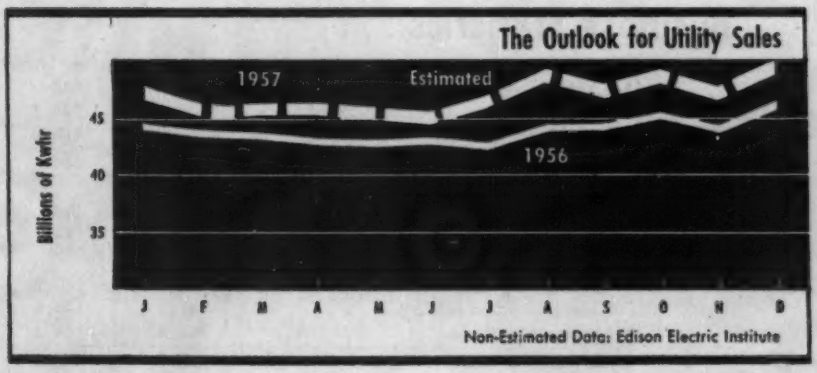
Ultimate stability of summer peaks promises higher return for longer pull. As these peaks level out, higher return can be produced by spreading operations of more efficient machines over a longer and higher level of demand. These longer hours duration of high demand, however, pose the problem of scheduling machine overhaul and may require additional capacity to maintain reserves sufficient for needed margins.

Cost-profit margins for many businesses may check out somewhat better this year than in 1956. Squeeze is still on, however. Costs are rising and will continue to do so, though at much slower pace than a year ago. More of the increase is being passed along to consumers, as seen in the pattern of wholesale prices now emerging.

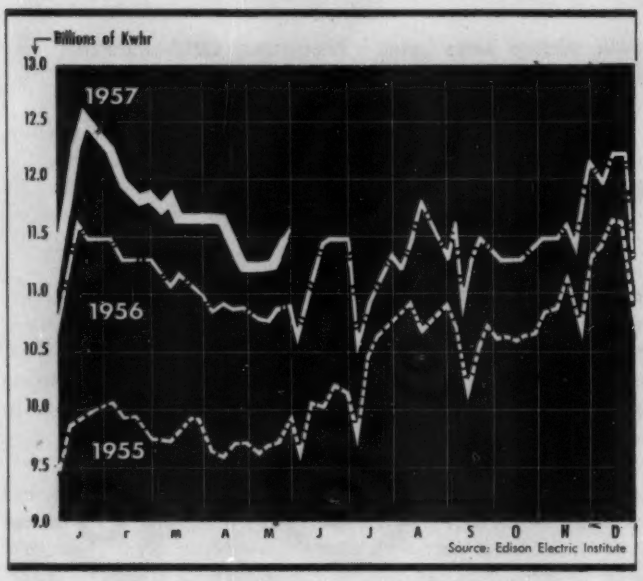
Some prices are off. Quotations on basic raw materials have dipped nearly 4% on Bureau of Labor Statistics wholesale price index so far this year. Prices of materials and components at intermediate stage of manufacture rose sharply during spring and summer of '56 then leveled off. Increases this year are likely to be modest—at least until steel industry issues new price list.

But prices are still being marked up on manufactured goods heading for the consumer and on capital equipment for industrial modernization and expansion. Prices on heavy industrial items edged up all last year with sharp spurt during the last half. Mark-ups on consumer durables became sharp in the fourth quarter, and on nondurables during past few months.

Yet all is not easy going on cost-price front. Demand for industrial equipment is probably near its peak. And consumers show some resistance to higher prices. To keep sales near present levels, industry will be forced to absorb some of the increased costs.



STATISTICS



OUTPUT

Week ended May 25,
11,574,000,000 Kwhr
Up 5.9%

Per Cent Change From Previous Year

	May 11	May 18	May 25
Total U. S.	+ 4.4	+5.9	+ 5.9
New Eng.	+ 4.2	+4.2	+ 6.5
Mid. Atlan.	+ 3.4	+5.0	+ 5.6
Cent. Ind.	+ 2.0	+4.4	+ 5.6
West Cent.	+ 5.1	+7.2	+ 5.3
Southeast	+ 7.7	+8.2	+ 7.9
South Cent.	— 3.1	+4.3	+ 4.9
Rocky Mount.	+ 3.1	+2.6	— 0.4
Pacific			
NW	+ 5.2	+6.7	+10.6
SW	+12.4	+9.4	+ 2.9

Seasonally Adjusted Index 228.5
Week Ago 228.1
Year Ago 215.3

Atomic Energy Commission requirements—1,150,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 6.3%.

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity } million kw	Mar.	121.78	121.33	116.56	4.5
Peak—Class 1 Systems. } million kw	Mar.	98.0	98.8	92.7	5.7
Estimated Dec. '57 Peak } million kw	Mar.	113.5	113.5	114.1	— 0.5
Production—billion kwhr	Mar.	52.45	48.67	50.34	4.2
Hydro		11.44	9.98	11.78	— 2.9
Fuel		41.01	38.69	38.56	6.4
Sales—billion kwhr	Feb.	47.78	49.15	45.41	5.2
Residential		14.25	14.44	13.06	9.1
Commercial		7.49	7.54	6.91	8.4
Industrial		23.65	24.68	23.20	1.9
Other		2.40	2.49	2.24	7.1
Fuel Consumption	Mar.				
Coal—million tons		13.84	13.21	13.39	3.4
Oil—million barrels		6.57	6.96	6.22	5.6
Gas—billion cu ft		93.15	83.24	85.17	9.4
Net Income Class A & B Co's—$ million	Mar.	126.81	142.34	116.86	8.5
Residential Customers—millions	12 mos.	45.92	45.81	44.59	3.0
Revenue per kwhr	ended	2.59¢	2.59¢	2.63¢	— 1.5
Avg. kwhr per customer	Feb. 28	3,004	2,985	2,800	7.3
Avg annual bill		$77.80	$77.31	$73.64	5.6

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	April	146	148	144	1.4
ENR Construction Cost	May	150.0	148.7	144.3	4.0
BLS Cost-of-living	April	119.3	118.9	114.9	3.8
New Orders for Machinery (1950 = 100)	Mar.	161	156	161	n.c.
NEMA Sales					
Insulation materials	Mar.	153	146	168	— 8.9
Electric appliances		97	94	120	—19.8
Wholesale prices	Mar.				
Motors and generators		140.7	140.2	126.9	10.9
Transformers and regulators		147.4	146.6	133.1	10.7
Switchgear and fuses		164.4	164.4	147.8	11.2
GNP—annual rate—$ billion	1st Qtr.	427.0	423.8	403.4	5.9%

MANAGEMENT BULLETIN

FINANCE

Electric utilities had only two offerings of new securities last week. This was probably due to the Memorial Day holiday. The first was 125,000 common share issue of Central Vermont Public Service Corp being offered at $17.00 a share by an underwriting group headed by Hallgarten & Co. The other was the offering of $3 million first mtg bonds ("A" rating) of Community Public Service Co (see p 19 for the details).

"Bonds were all sold by the second day" was the comment of Blyth & Co and Salomon Bros & Hutzler group when asked how the first mtg 5% bonds (A rating) due 1987 of Interstate Power Co offered at par had fared. Group had won the bonds earlier with a bid of 99.15%.

New security financing for electric and gas utilities has been normally heavy in May, Irving Trust Co has reported in its "Looking Ahead" bulletin. The calendar for June is "very full."

Electric utilities, the bank said, will sell $275 million in June and will be well balanced between debt, preferred, and common. Spacing of sales, warns John H. Childs, vp of Irving Trust, "is not as even, and there is some congestion in the first week of June."

Recent financing has been at such a fast pace that at the end of the first six months of 1957 the electric companies will have done as much financing as they did in 11 months in 1956.

Another debenture issue in the making. Montana-Dakota Utilities Co has asked the Wyoming Public Service Commission for authority to issue and sell at competitive bidding $10 million in convertible debentures.

Seattle, Wash., voters will get a crack at approving or disapproving a bond issue to finance installation of improved lighting system if the City Council accepts the recommendation of E. E. Lewarch, city traffic engineer.

Partnership is the answer. An estimated $3.2 billion will be needed for facilities to meet the power needs of the Pacific Northwest betwen 1958 and 1967, A. B. Martin, managment co-ordinator for Pacific Northwest Power Co, said recently. It is unreasonable, he states, "to expect that the federal government will supply more money for dam building in the Northwest than it has in the past." He noted that federal expenditures for power projects have averaged about $156.4 million a year during the last decade. "Means other than federal must be used to finance at least $2 billion of the 10-year capital requirement (1958-67)," he said. "All power groups—private, municipal and public utility districts—must do their share in providing their own power resources."

Pipelines to transport coal gets okay. North Carolina Senate passes bill which would allow condemnation of land for construction of pipelines to transport crushed coal mixed with water. Measure would give power companies the right of eminent domain in condemning land needed for such pipelines.

British Columbia Power Corp and its subsidiary, British Columbia Electric Co sold two issues quickly through Wood, Gundy & Co. Issue consisted of $40 million of 5¾% debentures of BC Electric due 1977 and 400,000 common shares of BC Power Corp. Securities were sold in units of $500 debenture and five common shares at $700 per unit.

Black Hills Power & Light Co sold $750,000 in 5% 30-year first mortgage bonds to Equitable Life Assurance Society of the United States.

"Potential Earnings Gains for 12 Electric Utility Growth Stocks" is the title of the latest Goodbody & Co research study. It points out that the chief measure of market value of a utility stock is the times earnings multiple. This study

was made to try and determine just how far ahead the market is discounting the earnings of the "fast growth" group today. For copy, write Ted Locke, Goodbody & Co, 115 Broadway, New York 6, N. Y.

LEGAL

Federal grand jury rules no violation by Union Electric Co in $35,000 lobbying fee case (EW, 12/3, p 15). John B. Stoddard, Jr, U. S. attorney says: "Unless some other evidence comes to our attention, this will complete our investigation." Dudley Sanford, executive vice president of the company had this to say: "We have felt all along that we had not violated the Holding Company Act and we are happy that the grand jury has come to the same conclusion."

ACQUISITIONS

Niagara Mohawk Power Corp will take over distribution properties. NYPSC gives approval to the corporation to buy the system of the Indian Lake Power & Light Co for $95,000.

Northern States Power Co simplifies its corporate structure. Federal Power Commission gives okay for the company to acquire two of its wholly owned subs, Saint Anthony Falls Power Co and Minneapolis Mill Co.

EMPLOYEE RELATIONS

Another wage settlement made. This time it is the Salt River Project Agricultural Improvement & Power District employees in Arizona which were granted a 5 to 14¢ an hour wage increase. The hike is now contained in an agreement, retroactive to April 1, signed by the project and IBEW.

RATES

This must have been a well-prepared rate case. In getting its $600,000 a year rate hike, Public Service Co of New Hampshire now reports that the hearing before the commission lasted only three hours. At the hearing, the company reports, "there was no customer opposition, no cross examination of company witnesses, and no adverse testimony."

Consolidated Edison Co of New York may be studying a rate increase. Pres Hudson R. Searing told stockholders recently that "we need to get more money for our services. A step in this direction is our effort to discontinue the provisions of our rate schedule which now permit groups of buildings under certain conditions to be billed as if they were a single unit." It is now pending before the NYPSC.

TAXATION

A plan for upping Richmond's city tax on electric, gas, and telephone bills to 9% (now 5%) has been made to the Richmond, Va., City Council by the city manager.

LEGISLATION

Here are two more utility relocation cost actions. Rhode Island Gov D. J. Roberts vetoed a bill which would have required reimbursement of public utility companies for the cost of moving their facilities when necessitated by federal-aid highway projects. He said: "In disapproving this measure, I am cognizant of the high cost of relocation of utility facilities, which, I am advised, could cost $20,000 per mile of construction or reconstruction. Since there is no separate fund available for the payment of the cost of relocating utilities, it is evident that to pay these costs will reduce the number of miles of highway construction that have been contemplated by the state."

An opinion by the Oklahoma state attorney general's office held recently that a bill passed by the 1957 state legislature providing for use of the 90-10 federal matching formula for relocation of public utilities along the interstate highway system does not violate the state constitution.

When specifying clamps or connectors choose the design that will

PROTECT Your CONDUCTOR!

D. C. HUBBARD, Chief Engineer, Conductor Specialties, A. B. Chance Co., says: "In choosing clamps or connectors, remember that they can protect—or damage—the most important part of your circuit... the conductor.

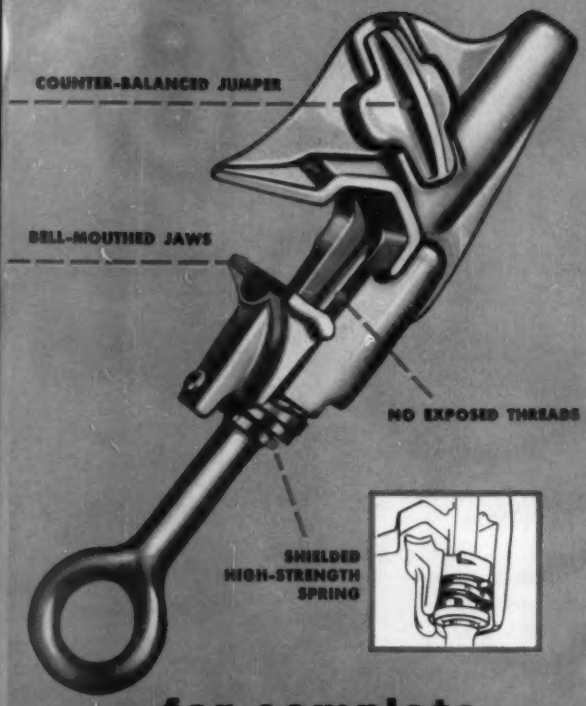
"Our 25 years of continuous development and manufacture of clamps and connectors have proven that properly designed clamps should distribute current to each strand for surge protection. They should have adequate contact area and proper contour for cold flow protection. They should have sufficient conductivity for thermal protection. They should be designed to protect conductor against vibration fatigue

"That's why Chance puts so much engineering into every tiny detail of clamp and connector design—to *protect your conductor.*"

Serving the Utility Industries since 1907

50TH ANNIVERSARY

A. B. CHANCE COMPANY



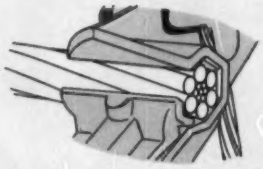
for complete

- **Conductor protection**
- **Contact protection**
- **Thread protection**

CHANCE PC CLAMPS

Chance PC (Protected Connection) Clamps offer extra protection for both conductor and clamp. The clamp is counter-balanced, light in weight to greatly reduce conductor fatigue, and is designed with bell-mouthed jaws to prevent sharp bending that could damage the conductor.

This diagram shows the extra wide jaws that make contact with every outside conductor strand.



Clamp contact with every outside conductor strand gives greater surge protection, better load distribution, less heating, less current loss —less radio and TV interference.

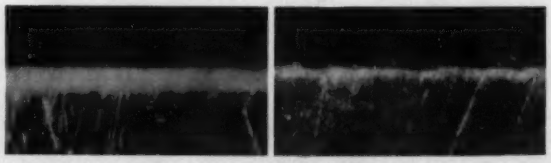
The shielded high-strength spring combined with an off-center-loaded eye screw compensates for thermal expansion and contraction of the conductor—keeps contacts tight at all times.

Quick tightening NC threads run in a chamber of all-weather lubricant to prevent corrosion and sticking—make removal and installation easy, even in corrosive areas. Threads are kept out of the arc zone—cannot be damaged by arcing.

Chance PC Clamps are available in all practical sizes and types for every conductor combination.

One AGP* Clamp can be used in all these combinations

Chance AGP Clamps, approved by power company after power company on the basis of their own tests, can be used for all types of connections: aluminum to aluminum, aluminum to copper, copper to aluminum, and copper to copper. They have the advantage of light weight which lengthens conductor life by minimizing the effects of vibration and makes them easy to handle with a clamp stick . . . plus easy identification by their distinctive appearance—plus their most important feature: Versatility. Available in both the "Protected Connection" and "Perma-Grip" types shown on this page.



Micro-photo above compares Chance AGP fortified cadmium coating (left) to commercial plating, one reason for AGP's success.

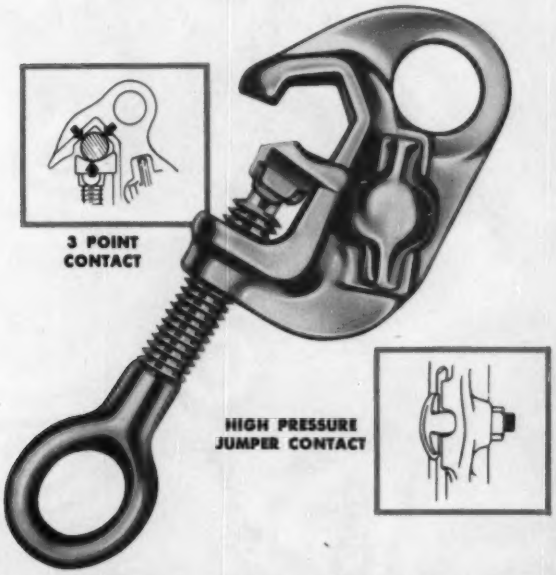
Chance FORTIFIED cadmium coating, applied .001″ thick to the aluminum body of the clamp—plus zln—gives you the best possible resistance to corrosion and electrolysis in all types of connections. This high density FORTIFIED cadmium coating gives extra long life protection to both the clamp and the conductor.

***CHANCE Aluminum General Purpose—Al to Al, Al to Cu, Cu to Al, and Cu to Cu**

PERMA-GRIP the service-proved clamp for all general applications

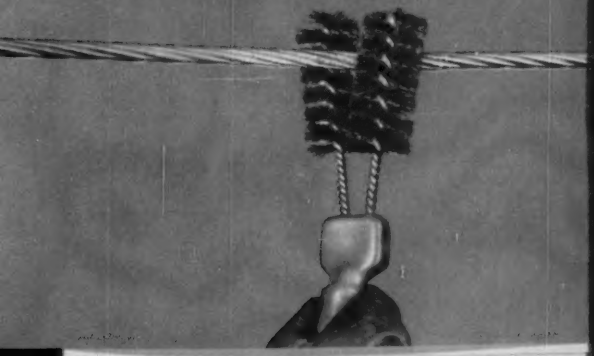
Chance Perma-Grip Tap Clamps have been an industry standard for over 20 years. Perma-Grip Clamps make permanent or temporary connections that hold tight and stay put without vibrating loose. The gripping jaws make 3 point line contact with the conductor. The high pressure jumper contact has a long bearing surface that makes complete contact with all strands.

Perma-Grip Clamps are available in a full range of types and sizes to handle all conductors—with or without armor rods.

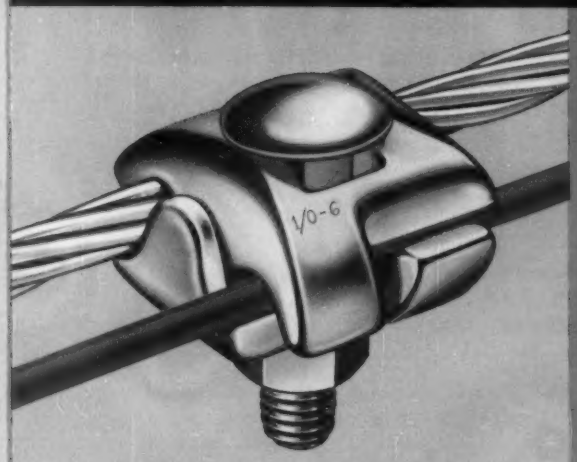


...and... for longer lasting connections

DAVE HUBBARD recommends: "Remember to wire brush surface oxides off the conductor. Then apply a good corrosion-resistant compound to both the conductor and the contact surfaces of the clamp. You'll protect your conductor and clamps against corrosion and oxidation—add years of life to your connections and reduce costly maintenance. This is particularly important in combating crevice corrosion. Use Chance zin Electrical Contact Aid and conductor cleaning brushes for best results."



There's always a CHANCE for a better connection

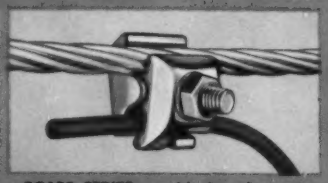


PARALLEL GROOVE CLAMPS

These parallel groove clamps are designed for low cost, easy to install power line connections. Aluminum alloy body has high resiliency to keep connections tight under all load and temperature conditions. Available in two types: "AA", uncoated aluminum body . . . and "AGP" with fortified cadmium coating for all conductor combinations: and in

Your choice of two designs

PG200 SERIES . . . fingers interlock around main line and tap line.



PG100 SERIES . . . wide jaw for main line—interlocking fingers for tap line.

CHANCE PARALLEL GROOVE CLAMPS ARE ALSO AVAILABLE IN 2 AND 3 BOLT TYPES FOR EXTRA CAPACITY.

NEW

U-BOLT CONNECTORS

make tight, low resistance connections

These aluminum-bodied U-Bolts maintain good connections under varying operating loads and temperatures. Designed to prevent "bird-caging" under surge conditions. Available with 1 or 2 bolts. Aluminum or steel hardware.

NEW

CHANCE SPLIT-BOLTS

high conductivity plus strength

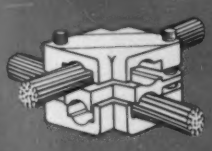
These newly-designed Chance connectors are forged from drawn copper, having the same characteristics as the conductor. These split-bolts stay tight longer because both clamp and conductor have the same coefficient of expansion.

NEW

UNICLAMPS

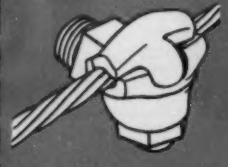
easy to apply—low cost

Now the popular Uniclamp is available with an aluminum body. "One piece" construction—can be installed without taking apart. Available in "AGP" for all connections and uncoated for aluminum connections. Four sizes fit all conductors up to 477 mcm. Uniclamps are also made with copper bodies for copper to copper.



MULTI-TAPS

For cross T, end to end, and parallel connections. Three sizes meet all requirements.



GROUNDING TERMINALS

High strength copper alloy connectors for grounding transformer tanks.

These connectors are part of the complete Chance line which offers a wide variety of clamps and connectors to meet every need. See your Chance Distributor, or write A. B. Chance Company, Centralia, Missouri, for full information.

CC57-3

A·B·CHANCE CO·

ABC INDUSTRIES

L-M Expands Permaline Plants by a $1,000,000 Investment

Expansion is completed at Line Material Industries plants in Barton, Wis., and Sherman, Texas, where Permaline products are made, advises Pres R. G. Wheaton. L-M has invested nearly $1 million in production machinery, enlarged warehouses, and improved employee facilities at the two plants. New machinery includes equipment for the making of bituminized fiber fittings and the electronically controlled production of fiber conduit in 10-ft lengths.

Production of L-M Permaline products is expected to increase 35%. Greater production and expanded marketing facilities, Wheaton said, will expedite customer's orders. L-M offers bituminized fiber conduit in lengths of 5, 8, and 10 ft, along with a complete line of cast iron, plastic, and fiber fittings.

In the picture E. A. Kaufman, buyer of A. F. McDonald Co, Dubuque, Iowa, examines a 10-ft length of 4-in. fiber tubing formed on a new machine at the Barton plant. Plant manager L. Bowerman (left) holds an 8-ft length for comparison while Product Manager W. M. Bloom (right) holds a 5-ft length of tubing.

GE Reports Developments for Two Industrial Services

General Electric Co has reported on industrial applications of instruments and a power system.

• Received an order for 30 type CH recording instruments for accurate power measurements of premixer and mixer motors on automatic dough-mixing equipment, called the Do-Maker, developed and marketed by Baker Process Co. The Do-Maker automatically meters and mixes various bread dough ingredients and deposits in pans the exact amount for one loaf.

• For powering a 55-cu yd, 2,400-ton shovel, reportedly largest built by Bucyrus-Erie Co, two m-g sets were supplied having a maximum capacity of 7,500 hp and weighing a total of 163,000 lb. Total electrical system for shovel includes 11 motors for digging operation and four others for individual tractor operation. A 3,750-kva, 34.5-4.1 kv, low center of gravity, skid-mounted substation supplies power for the shovel. This mammoth shovel is owned jointly by W. G. Duncan Coal Co and Peabody Coal Co. It is operated by Peabody in River Queen mine along Green River in western Kentucky's Muhlenberg County.

Kuhlman's General Offices Open at Birmingham, Mich.

Kuhlman Electric Co's general offices are now located at 2565 East Maple Road, Birmingham, near Detroit, Mich. New telephone number is Midwest 6-7400.

The new office is designed to offer greater central control for coordinating the activities of the company's divisions at Bay City, Mich., (transformers and Detroit electric furnaces); Crystal Springs, Miss., (transformers); Salinas, Calif., (transformers); and Detroit (Bonderizing process).

The two-story brick structure has an office area of approximately 15,000 sq ft. Here are located the executive offices, also sales, design engineering, purchasing, accounting, and advertising departments.

Co-ops 33-Mw Generator Ordered from Elliott Co

Corn Belt Power Cooperative, Humboldt, Iowa, has purchased a 33,000-kw turbine-generator from Elliott Co, Jeannette, Pa. This is the largest unit to be contracted by Elliott Co, it is reported.

Corn Belt Power Cooperative has purchased four Elliott turbine-generator units totaling approximately 50,000 kw since this utility was established in 1947. The new 33,000-kw unit will be installed in a new station with a planned ultimate capacity of 66,000 kw.

Elliott Co reached a decision, about eight years ago, to enter into the manufacture of larger turbine-generator equipment, such as are needed by central stations, and has been preparing continuously for these larger ratings, it was said.

Manufacturing and testing facilities to accommodate this larger equipment have been installed to keep pace with the design and development program over these years.

(More M&M on page 128)

Fuel Use Predicted for Electric Generation

Total coal, oil and gas use for generation of electric power shows a 38% increase for the next five years, according to predictions in the Keystone Coal Buyers Manual, a McGraw-Hill publication.

Based on U. S. electrical generating capacity of 98 million kw by steam generation and 221 million tons of coal equivalent (coal 157, oil 17, gas 47) for 1956.

For 1960 the 38% increase is based on 138 million kw capacity by steam generation and 306 million tons of coal equivalent (coal 210, oil 25, gas 71).

For the next five-year period, ie, in 1965, the fuel use is expected to have about a 34% increase. The 1965 basis data are: 215 million kw capacity by steam generation and 410 million tons of coal equivalent (coal 282, oil 28, gas 100).

L-M Starts Transformer Production at Visalia

The new $1.25 million West Coast plant of Line Material Industries at Visalia, Calif., went into production in mid-May, turning out 40 to 50 L-M Round Wound distribution transformers daily. It is the company's eleventh plant.

Initially, the factory will produce 5 to 50-kva transformers only, but the company plans additional lines later. Location of the 65,000-sq ft plant on a 20-acre plot provides space for future expansion.

Of the 100 people to be employed at Visalia 95% will be hired locally. A few key employees, including Factory Manager Wayne Shelley, were transferred from other areas. Shelley formerly was assistant superintendent at the Zanesville, Ohio, plant.

U. S. Copper Production

Primary copper production in the U. S. during April amounted to 98,856 tons, according to the Copper Institute, New York. The amount is almost 2,500 tons greater than for March. Refined production totalled 144,013 tons for April, compared to 143,961 tons for the previous month. Deliveries to fabricators amounted to 116,716 tons, up 3,145 tons above March. Refined copper stocks at end of April was 139,842 tons, a decrease of about 350 tons from the amount for the prior month.

Order 11,000-Amp Bus, Gas-Filled Transformer

General Electric Co has reported receiving orders for two outstanding equipments.

An isolated phase bus rated 11,000 amp, believed to be the highest rated bus built to-date, will be furnished for Chiba thermal power station of Tokyo Electric Power Co. It will connect a 175,000 kw GE turbine-generator to station step-up transformers. With forced-air cooling, the new bus will require smaller housing, and as a result will reportedly offer economic and space-saving advantages.

A gas-filled transformer, rated 10,000 kva, 62.7-12.5 kv, is being built for Pennsylvania Power and Light Co, and is scheduled for delivery in 1958. It is reported to be larger than any yet built and the third example of this design. Cooled and insulated by sulphur-hexafluoride gas, SF_6, the new transformer should be quieter, lighter and safer than oil-filled units, according to GE engineers. Two 2,000-kva gas-filled transformers were built by GE last year.

M & M BRIEFS

Plymouth Rubber Co, Canton, Mass., held a representatives conference, outlined a new merchandising plan for its line of electrical tapes spearheaded by the Slipknot brand, and told of plans for plant expansion.

Curtis Lighting, Inc, Chicago, has formed a contract division to sell Alzak and anodized aluminum processing to the metal-finishing industry, stated John A. Wright, president. "With a capacity of 6,000 sq ft of aluminum per shift", Wright said, "the plant can easily handle contract requirements as well as our own needs."

GE Lamp Division has established six new service districts. The districts and managers are: Tampa (Fla.), Dale H. Sacia; Rock Island (Ill.), Vaino J. Saari; New Orleans (La.), Philip J. Pendergast; Houston (Tex.), James H. Strain; Charlotte (N. C.), Thomas P. Holden; Baltimore (Md.), Allen B. Minter, Manager.

Lukens Steel Co, Coatesville, Pa., has a $33-million expansion program to boost its rated ingot capacity by nearly 25%—from 750,000 tons to more than 925,000 tons annually. Included are a 100-ton electric furnace, a four-high 140-in. breakdown mill, and soaking pits. Also a $1 million physical testing laboratory has been contracted and scheduled for operation in 12 months.

Battelle Institute, Columbus, Ohio, is investigating tellurium-base semiconducting materials for use in rectifiers, electronic refrigeration and solar batteries.

Texas Instruments, Inc, has moved the marketing department offices of its Semiconductor-Components division to 2929 Cedar Springs Road, Dallas, Texas, from 6,000 Lemmon Avenue. This move is prior to completion of the division's new plant under construction on North Central Expressway in Dallas.

Sylvania Electric Products, Inc, has signed a 52-week contract to sponsor "The Real McCoys", a new situation comedy series, according to the American Broadcasting Co. This show will be broadcast on ABC television Thursday at 8:30-9 PM, EDT, starting Oct. 3. It stars Walter Brennan, a three-time Motion Picture Academy-Award winner.

RIWC-Rockland Insulated Wire & Cable Co, Haverstraw, N. Y., has developed a planetary cabling machine for insulated miniature cables with wires as small as No. 32 Awg. Various plastic formulations are available. Bulletin 1-57 describes the cables.

For Fly Ash Collection...

Western Precipitation
presents
its latest development
in a quarter-century of
continuous advancement
in Mechanical Collectors

...The "9VGR" MULTICLONE!

Over 25 years ago

Western Precipitation Corporation pioneered the high-efficiency multiple-tube principle that has proven so superior it is now the pattern for the industry.

The Multiclone continues to be years ahead of all other centrifugal collectors because it incorporates the invaluable "know-how" gained through these many years of leadership in the field —leadership that is further emphasized by introduction of the 9VGR Multiclone, another important milestone in Multiclone's quarter-century of outstanding performance.

COTTRELL Electrical Precipitators
MULTICLONE Mechanical Collectors
CMP Combination Units
DUALAIRE Reverse-Jet Filters
HOLO-FLITE Processors

NEW 9VGR FEATURES...

1. *No need for continuous external support.*
2. *Easier and less costly to insulate.*
3. *Minimum dust stratification.*
4. *Improved dust distribution to all tubes.*
5. *Simpler installation, lower erection costs.*
6. *Freedom from leakage at all critical points so that full collection efficiency is obtained.*

Plus **The proven superiority of CAST IRON TUBES and VANES!**

Through the years, others have tried special alloy steels and so-called "miracle" metals, but nothing has proven as satisfactory *in actual field service* as cast iron. In the past quarter-century more than 270,000 Multiclone tubes have been placed in service with less than 1.85% replacement—*a performance record unequalled in the industry!*

There are many other advantages built into the 9VGR. There is a Multiclone representative near you who will be glad to supply complete details. Or write direct, asking for your free copy of Bulletin #M209 which contains full details.

Western Precipitation Corporation

Designers and Manufacturers of Equipment for Collection of Suspended Material from Gases ... and Equipment for the Process Industries

Main Offices: **1004 WEST NINTH STREET, LOS ANGELES 54, CALIFORNIA**

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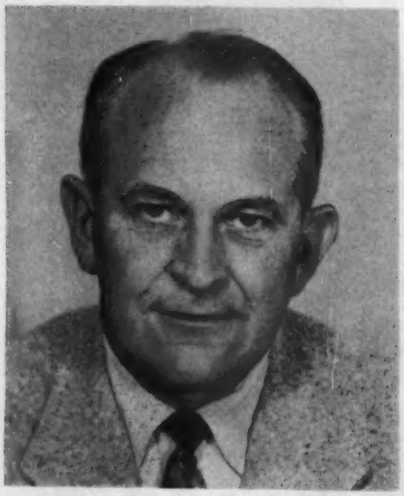
Precipitation Company of Canada Ltd., Dominion Square Building, Montreal
Representatives in all principal cities



AXEL H. HERBERT

Herbert Advances to VP Post

Minnesota Power & Light Co's board of directors has announced the election of Axel H. Herbert as vice president and assistant general manager of the utility.

Herbert, a 31-year employee of Minnesota P&L, has served as assistant general manager for the past year. Since joining the utility in 1926 he has risen to positions of increasing responsibility, and was appointed assistant to the general manager at the company's home office in Duluth in the summer of 1954. He has also been division manager in Little Falls.

In addition to Herbert's election, Carl J. Thureen was named an assistant treasurer. He comes to this position from that of chief clerk of the treasury department.

DP&L Ups Rutherford to VP

Newly elected vice president and commercial manager of Dallas Power & Light Co is P. M. Rutherford, Jr, former commercial manager and head of the commercial department.

An electrical engineering graduate of University of North Carolina, Rutherford has been associated with Dallas P&L since 1934. After serving as lighting director for seven years, he was named assistant general sales manager in 1941. He became advertising manager in 1944 and was named to his most recent position in 1953.

Before joining Dallas P&L, Rutherford was with Tennessee Public Service Co for two years as supervisor of commercial sales. Rutherford's business career began in 1925 with Curtis Lighting, Inc. In 1928 he became resident engineer at the company's Atlanta, Ga., headquarters.

P. M. RUTHERFORD JR

ROBERT F. SCOTT

Scott Is New VP at SWG&E

Robert F. Scott, formerly Louisiana Division manager for Southwestern Gas & Electric Co, has been elected a vice president of the Shreveport, La., utility.

Scott has been employed by Southwestern G&E since 1937, when he joined the utility as manager of the Louisiana Division's new business department. In 1946 he was elevated to the post of assistant Louisiana Division manager, and remained in that capacity until 1956, when he was named to his previous position.

Scott, who received his B.S. degree in electrical engineering at the University of Maine, began his career with Stone & Webster, Inc, in 1928. He worked for two subsidiaries of S&W before joining Southwestern.

I. W. BORDA

Borda Rises to Sales VP Post

The Okonite Co has named as its new vice president and general sales manager I. W. Borda, formerly vice president and manager of Pacific Coast Sales.

In his new position, which he will assume on or about July 1, he will have responsibility for all field sales personnel and market specialists.

Borda, who has been identified with Okonite since 1924, has had long experience in sales and sales management with the company. He has been a vice president of the concern since 1949.

Educated at the United States Military Academy at West Point, Borda is a past president of the Pacific Coast Electric Association.

Babbitt Becomes Chief Engineer

Harry Z. Babbitt has been appointed to the new position of chief engineer of Black Hills Power & Light Co. He will be in charge of research and development for immediate and long-range planning.

Babbitt, a graduate of Kansas State College, has been with Black Hills since 1947. His former positions with the utility include general superintendent, manager of production, and manager of system planning and production. He was previously affiliated with Northwestern Public Service Co for 17 years and with Kansas Electric Power Co.

In a simultaneous promotion Joseph Munro was appointed production superintendent and will be in charge of the utility's generating plants.

HARRY Z. BABBITT

PERSONAL BRIEFS

Donald J. Winfield is new assistant secretary and assistant treasurer of Middle South Utilities, Inc.

At Iowa Southern Utilities Co, **George T. Perrine** was named to the newly created post of sales consultant. **Henry A. Little** succeeds him as general sales manager, and **Gordon Cooper** has been appointed Newton district manager. All appointments are effective July 1.

Mississippi Power & Light Co has made the following appointments: **Joe B. Fountain,** from vice president and chief engineer to vice president of operations; **Ray W. Braswell,** vice president, to assume responsibility for engineering and construction, in addition to former duties; **H. B. McGehee,** to manager of division operations; **F. A. Bell,** to state meter superintendent; **K. M. Hester,** to assistant meter superintendent; and **N. I. Presson** to construction superintendent.

New president of Nuclear Power Group, Inc, is **Willis Gale,** chairman of Commonwealth Edison Co. He succeeds **Philip Sporn,** president of American Gas & Electric Co.

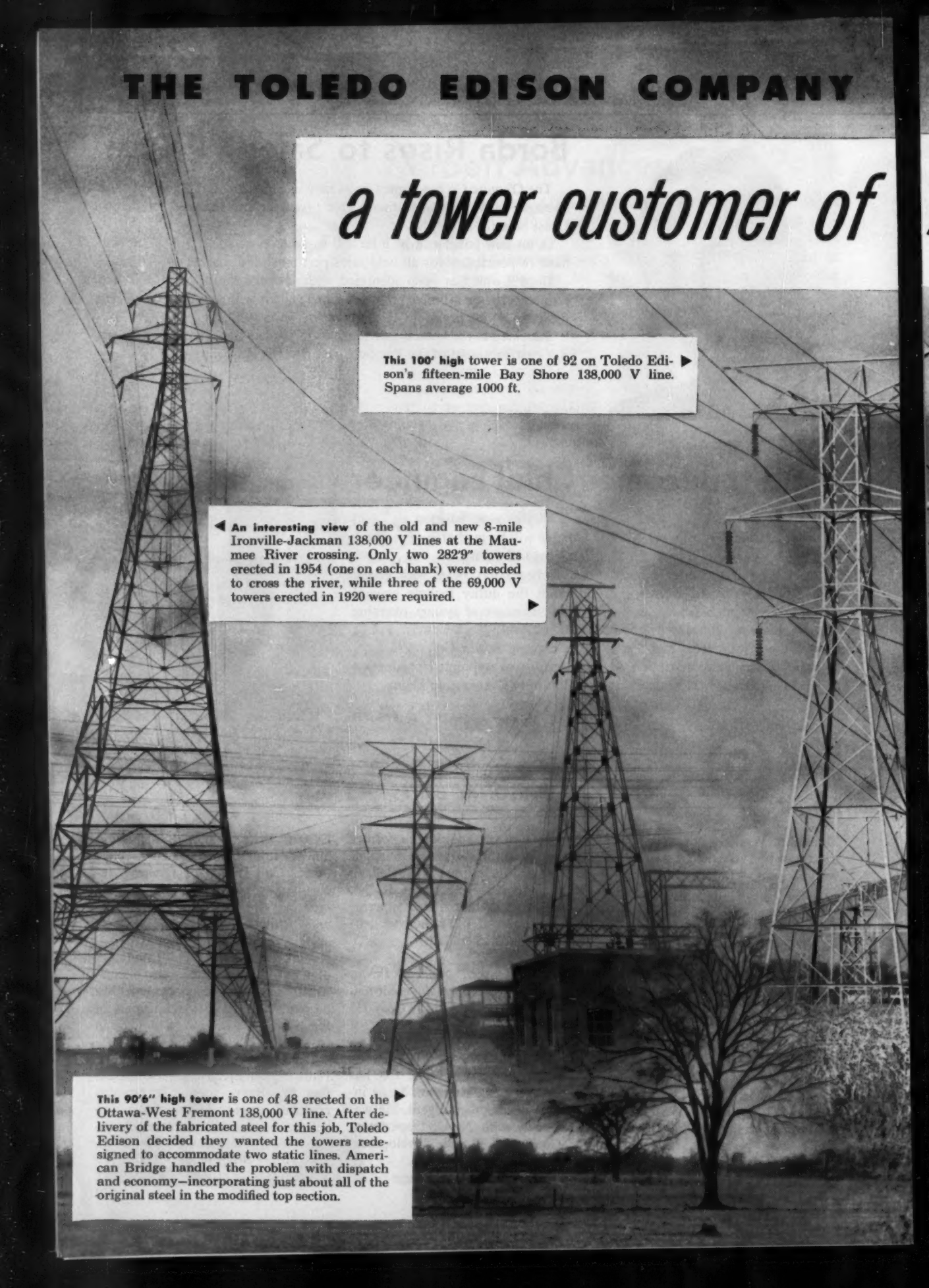
Carolina Power & Light Co has designated **B. L. Branson, Jr,** as industrial development agent. He was previously with N. C. Department of Conservation and Development as development engineer.

Eduard Fritz is new transmission line consultant in Potomac Electric Power Co's station engineering department. He formerly held the same position with Day & Zimmerman, Philadelphia.

Robert W. Gillette, senior engineer of Consolidated Edison Co's electrical engineering department, has been elected 1957-58 chairman of the New York section of American Institute of Electrical Engineers.

Philadelphia Electric Co's **Constantine W. Bary,** economic analysis engineer, was recently named a consultant on special projects, executive office, President of the U. S.

(*More Briefs on page* 134)


THE TOLEDO EDISON COMPANY
a tower customer of
This 100′ high tower is one of 92 on Toledo Edison's fifteen-mile Bay Shore 138,000 V line. Spans average 1000 ft.
An interesting view of the old and new 8-mile Ironville-Jackman 138,000 V lines at the Maumee River crossing. Only two 282′9″ towers erected in 1954 (one on each bank) were needed to cross the river, while three of the 69,000 V towers erected in 1920 were required.
This 90′6″ high tower is one of 48 erected on the Ottawa-West Fremont 138,000 V line. After delivery of the fabricated steel for this job, Toledo Edison decided they wanted the towers redesigned to accommodate two static lines. American Bridge handled the problem with dispatch and economy—incorporating just about all of the original steel in the modified top section.

American Bridge for 37 years

A GOOD GAUGE of a manufacturer's dependability—product-wise and service-wise—can usually be found in the length of time it holds its customers and the repeat business it continues to receive.

An interesting example of a satisfied American Bridge customer is the Toledo Edison Company. American Bridge has been designing and fabricating transmission towers for this important and growing Midwestern power company since 1920!

Toledo Edison is just one of scores of customers who have shown a decided preference for American Bridge transmission towers. Many have used *only* American Bridge towers. Others have occasionally switched, *only to return to American Bridge when experience proved that American Bridge towers cannot be matched.*

American Bridge offers you the finest towers *at the lowest possible price!*

Since 1911, American Bridge has maintained a modern plant which specializes in the fabrication of electric transmission towers, substations and similar structures. Its facilities and equipment are designed specifically for that purpose, and the savings accomplished assure you a fine quality product at the lowest possible cost.

American Bridge strives to keep foundation costs low in its tower design. The rotated-type tower and circular grillage are two examples of how American Bridge works with its customers in a cooperative effort to reduce foundation costs.

The tower members furnished by American Bridge fit in the field. Members are made alike on all four sides to facilitate erection. The same diameter bolts are used throughout the structure. These are sorted, packed and marked so that no time is lost looking for the right bolts for the connections; and the bolts themselves are the best obtainable. Every member is stamped in the steel with the correct number to coincide with the easily read erection drawings. *The fundamental reason for all this is to save you money.*

All American Bridge towers are galvanized *after* fabrication by the hot dip process. The resultant coating of pure zinc lasts for years.

Every American Bridge tower is designed to meet specific conditions.

American Bridge towers are carefully designed for the specific conditions of loading expected on your line. The dead load, the wind, the ice, angles in line, broken conductors, etc.—if they are to be expected on your line, the towers are designed to take them.

American Bridge is the leading tower fabricator in America. To achieve that position required that we make a better tower . . . to maintain it, *we will continue to provide quality structures, competitively and on time.* It will pay you to call our tower experts.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

Contracting Offices in: AMBRIDGE • ATLANTA • BALTIMORE • BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER
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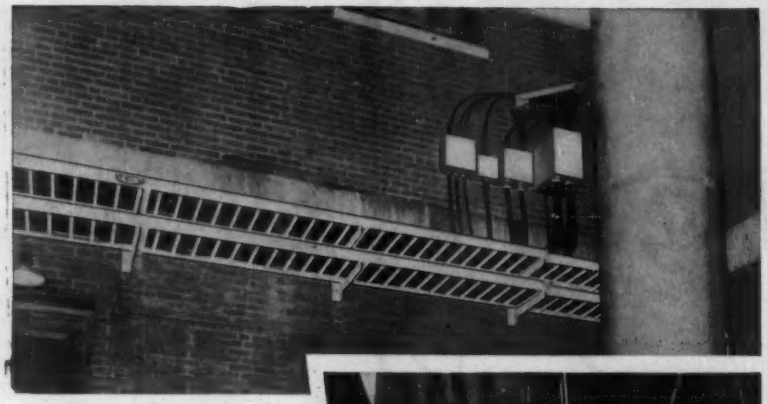
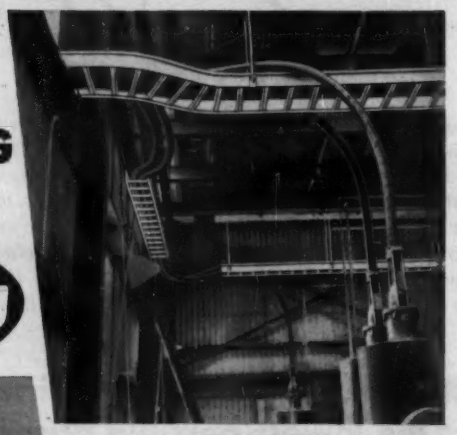
PITTSBURGH • PORTLAND ORE. • ROANOKE • ST. LOUIS • SAN FRANCISCO • TRENTON • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

AMERICAN BRIDGE

Transmission Towers

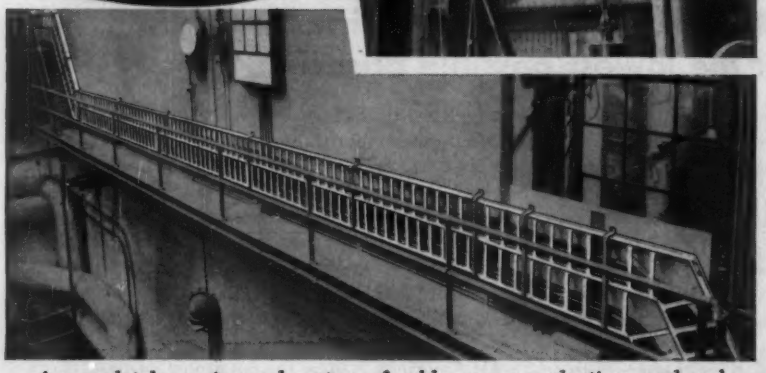
UNITED STATES STEEL





a new, superior system of CABLE and TUBING RACE WAYS...

Globetray
PAT. PENDING



A completely engineered system of cable ways, production produced and die formed for uniformity with up to twice the strength of ordinary trays, by actual laboratory tests. The universal splice plate joins all parts through the side channels only. All curved fittings are joined at the end of the radius (no tangent material is required) permitting continuous curves. This feature provides greater flexibility of application in tight places and creates an endless variety of combinations for a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings.

Comes in 6", 12", 18" and 24" widths, in standard 12' lengths to further speed up installation time. Cable way can be cut to length at any point—insides and bottom always smooth—all sections punched for easy installation—perfect fit at all times. Neat, clean and uniform in appearance.

Globetray
THE GLOBE COMPANY

EASY TO INSTALL • SAVES TIME • SAVES ON MATERIAL
GALVANIZED • NO MAINTENANCE PROBLEM

Write for new complete catalog. Distributors in all principal cities. Contact the Grip-Strut distributor under "Conduits" in the classified telephone directory.

PRODUCTS DIVISION The GLOBE Company

4030 S. PRINCETON AVE. • CHICAGO 9, ILL.

Personal Briefs

(*Continued from page* 131)

Recently elected to membership in Controllers Institute of America were **R. A. Delaney,** secretary and controller, Missouri Public Service Co; **Arthur L. Burgess,** comptroller, Northern States Power Co; **Cortis N. Rice, Jr,** operations controller, NSP; and **Albert E. Miller,** director of finance and accounts, United Gas Improvement Co.

New manager of General Electric Co's station and power switching equipment sales, High Voltage Switchgear Department, is **Grady L. Roark** . . . GE has named **C. E. Geary** as manager of advertising and sales promotion for its Direct Current Motor and Generator Department.

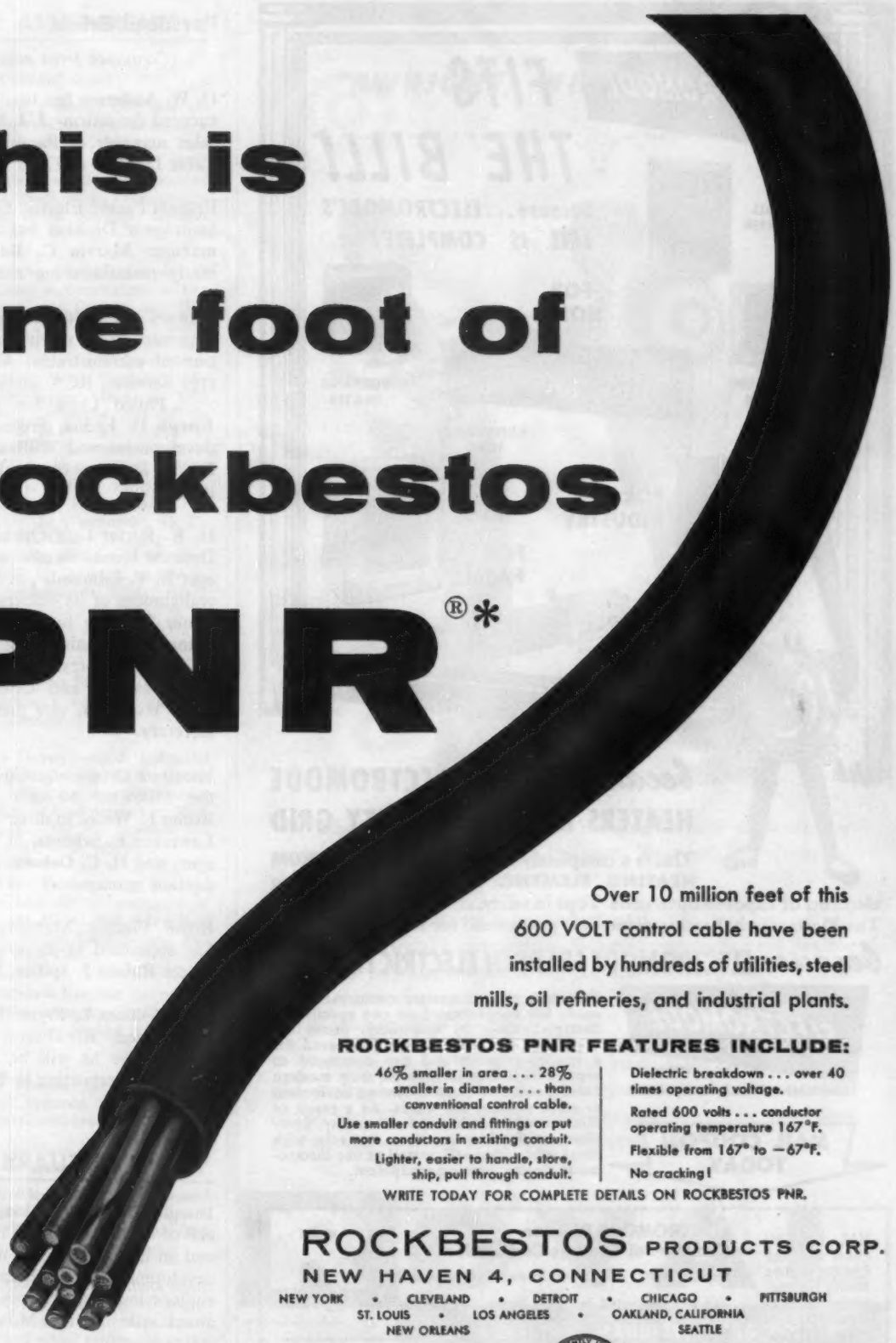
W. E. Korsan has been made manager of sales of Allis-Chalmers Manufacturing Co's electrical application department. Succeeding him as St. Louis district manager is **J. C. Lovelace** . . . A-C's Industries Group has designated **W. M. O'Connor** manager, Amarillo district . . . **J. S. Morgan** was recently named director of domestic sales for A-C's Industries Group . . . **Dr Dimitri Kececioglu** has been appointed assistant to the director of mechanical engineering, Industries Group.

Westinghouse Electric Corp has announced the following appointments: **George S. Evans** has been named manager of fluorescent lamp engineering; **Henry John Soubielle** is new Pacific Coast regional engineer of the company's Lamp Division; **Milton S. Angier** has been appointed manager of the Toledo branch office of the firm's Apparatus Division; **Roger H. Bolin** becomes director of advertising for the company; and **B. H. Boatner** is newly elected vice president of Westinghouse Electric Supply Co and general manager of the firm's Apparatus and Supply Division.

At Thomas & Betts Co, **A. Ren Lee** was made utility product manager, Eastern Division; **James L. Fleming,** utility product manager, Western Division; and **Richard J. Heh,** assistant product manager, Utility Division.

(*More Briefs on page* 136)

This is One foot of Rockbestos PNR®*



Over 10 million feet of this 600 VOLT control cable have been installed by hundreds of utilities, steel mills, oil refineries, and industrial plants.

ROCKBESTOS PNR FEATURES INCLUDE:

- 46% smaller in area . . . 28% smaller in diameter . . . than conventional control cable.
- Use smaller conduit and fittings or put more conductors in existing conduit.
- Lighter, easier to handle, store, ship, pull through conduit.
- Dielectric breakdown . . . over 40 times operating voltage.
- Rated 600 volts . . . conductor operating temperature 167°F.
- Flexible from 167° to −67°F.
- No cracking!

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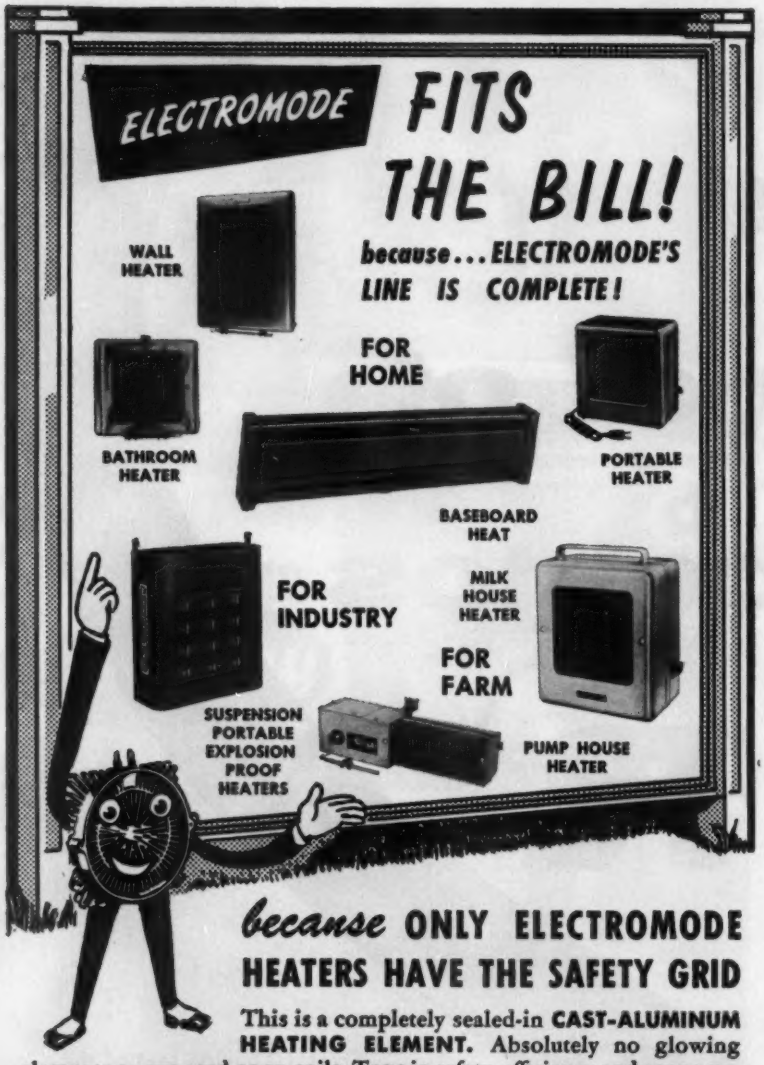
NEW ORLEANS SEATTLE

*P — polyethylene, N — nylon, R — Rockhide (PVC)



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This is a completely sealed-in **CAST-ALUMINUM HEATING ELEMENT.** Absolutely no glowing elements or exposed open coils. Tops in safety, efficiency and economy. The Electromode heating element is guaranteed for five years.

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For more than a quarter century Electromode has concentrated on one specific industry—heating by electricity. From the beginning Electromode has pioneered for a quality product and has continued to expand its line to include the most modern developments in electric heating equipment to serve present day needs. As a result of Electromode's firm stand on quality, complete satisfaction has been the rule with those who either sell, install or use Electromode electric heating equipment.

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MAIL COUPON! Please send your FREE Electric Heating File, containing specifications, illustrations, installations, prices and how to figure electric space heating.

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We are interested in ☐ Home ☐ Industrial ☐ Farm

Name.....

Address.....

City.....Zone.....State.....

Personal Briefs

(*Continued from page* 134)

O. W. Andersen has been named to succeed the retiring **J. J. Madden** as sales manager of Paranite Wire & Cable Division of Essex Wire Corp.

Federal Pacific Electric Co's Pacific Switchgear Division has as its new manager **Marvin C. Bonine,** formerly manufacturing manager.

Howard A. Baldwin was recently appointed to the newly created position of administrator, Atomic Energy Services, RCA Service Co, Inc . . . Philco Corp has designated **Joseph D. Lydon** director of sales development and **William T. Quillen, Jr,** as manager of sales training production.

H. K. Porter Co's Quaker Rubber Division has as its new works manager **B. V. Edmunds** . . . In a recent realignment of its officers, Wolfe & Mann Mfg Co has elected **W. J. Mann, Jr,** to chairman of the board; **W. B. Mann** president; **H. T. Fee,** vice president and treasurer; and **E. L. Wolfe, Jr,** vice president and secretary.

Interstate Drop Forge Co has named the following to new positions: **Bruno E. Weiss,** to director of sales; **Lawrence F. Schuetz,** to sales manager; and **H. C. Osborn, Jr,** to production manager.

Royal Electric Manufacturing Co has appointed as its new chief engineer **Robert J. Spillar, Jr.**

Capt William L. Pryor (USN, Ret), has joined Rockbestos Products Corp where he will be on special assignment reporting to **Pres Albert S. Redway.**

OBITUARY

Douglas Burnett, 85, long time official of Baltimore Gas & Electric Co and an important figure in the early development of electrical and gas engineering, died recently of a heart attack at his Sparks, Md., home.

Charles C. Cheyney, 68, vice president of sales for Buffalo Forge Co, died recently after a heart attack.

SALES ASSIGNMENTS

COMPANY STAFFS

BullDog Electric Products Co's new office in Ft. Wayne (Ind.) has as its new field engineer Edward F. Maisel.

Colorado Fuel & Iron Corp has appointed George C. Jennings New York district sales manager of its Wickwire Spencer Steel Division.

Leeds & Northrup Co has assigned the following resident representatives to two new field offices. At Towson, near Baltimore, the staff consists of J. C. Emerline, manager; R. M. Robertson, and R. C. Thomas, Jr, and will serve Maryland and eastern West Virginia. The northern New Jersey office at East Orange, serving the upper half of the state, has as its staff J. C. Latham as manager, and E. W. Rowland, Jr, R. B. Smith, H. C. Strauch, and G. C. Whitehead . . . Other recent appointments were: J. D. Casey to Baton Rouge, La.; W. J. Clark, Jr, to Washington, D. C.; G. J. Demos to Albany, N. Y.; J. E. Donohue and J. C. Rutledge to Winston-Salem, N. C.; D. D. Duckwitz and W. E. Fischer to Grand Rapids, Mich.; H. G. Huckelberry to Davenport, Iowa; T. W. Shorts to Des Moines, Iowa; and C. T. Smith to Richmond, Va.

Phelps Dodge Copper Products Corp has designated Richard I. Wilson as Philadelphia district manager.

Philco Corp's Government & Industrial Division has named John R. Campbell regional sales manager for the western regional area with headquarters at Redwood City, Calif. He will supervise the Los Angeles and Seattle offices.

Preformed Line Products Co has appointed three new district managers of sales. They are R. A. Bell, Cleveland district; E. H. Brown, Eastern area; and D. B. Evans, West Coast.

Joseph T. Ryerson & Son, Inc, has named James E. Burke manager of alloy and stainless steel sales at the Pittsburgh steel service plant.

Westinghouse Electric Corp has designated Ralph Z. Sorenson as headquarters utility sales representative.

REPRESENTATIVES

General Electric Co's Metallurgical products department has named Southern Tool Distributing Co of Atlanta, Ga., as authorized cutting tool distributor.

Moloney Electric Co has appointed Wenz Electric Sales as sales and service representatives of power and distribution transformers and allied equipment in the tri-state area. The Wenz concern was recently formed by R. D. Wenz, former general purchasing agent of Duquense Light Co.

When that new substation is delayed for lack of switchgear or connectors, *somebody's* on the spot. To avoid this situation, place your order with Royal.

Whenever delivery is an important factor, be sure . . . call Royal *first!* Royal's compact operation is purposely kept flexible —so each order gets custom service and *delivery when needed.* Every one of our customers get this "Royal treatment" . . . it's a customer pledge we live by.

Whether your job is normal or rush, large or small, you'll like dealing with Royal — for switchgear, any of 5,000 standard connectors, or specially engineered designs. Next time, save time and trouble — order from Royal Electric.

ROYAL

A part of the arsenal of AMERICAN POWER PRODUCTION

ROYAL ELECTRIC MANUFACTURING CO., INC.
1122 EAST 87TH STREET • CHICAGO 19, ILLINOIS
Designers and Manufacturers of Power Switching Equipment and Special Electrical Devices

MEETINGS CALENDAR

JUNE

American Management Association — General Management Conference, Statler Hotel, New York, N. Y., June 3-5.

Edison Electric Institute—Annual Convention, Palmer House, Chicago, Ill., June 3-5.

American Society of Refrigerating Engineers—53rd Annual Meeting, Hotel Fontainbleau, Miami Beach, Fla., June 3-5.

National District Heating Association—48th Annual Meeting, The Homestead, Hot Springs, Va., June 3-6.

Electric Association—Chicago Electrical Industry Show, Conrad Hilton Hotel, June 4-6.

American Institute of Electrical Engineers—Industrial Power Rectifiers and Semiconductor-Metallic Rectifiers Committees, Morrison Hotel, Chicago, Ill., June 4-5; Summer General Meeting, Sheraton Mount Royal Hotel, Montreal, Quebec, June 24-28.

• **National Society of Professional Engineers**—Annual Meeting, Statler Hilton Hotel, Dallas, Texas, June 6-8.

• **American Society of Mechanical Engineers**—Semiannual Meeting, Sheraton-Palace Hotel, San Francisco, California, June 9-14; 21st National Applied Mechanics Division Conference, University of California, Berkeley, Calif., June 13-15.

Public Utilities Association of the Virginias—Accident Prevention Conference, Daniel Boone Hotel, Charleston, W. Va., June 14; Sales and Publicity Committees, Charlottesville, Va., June 20-21.

American Society for Testing Materials—Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 16-21.

Industrial Management Center — Fourth Annual Material Handling Training Conference, Lake Placid, New York, June 16-29.

American Society for Engineering Education—Annual Meeting, Cornell University, Ithaca, N. Y., June 17-21.

Canadian Electrical Association—Annual Convention, Manoir Richelieu, Murray Bay, Quebec, June 19-21.

Wisconsin Utilities Association—Annual Convention, Accounting Section, Kings Gateway Hotel, Land o' Lakes, Wisconsin, June 23-25.

Michigan Electric Association—Grand Hotel, Mackinac Island, Mich., June 23-26.

American Society of Heating and Air Conditioning Engineers—Semi-annual Meeting, Manoir Richelieu, Murray Bay, Quebec, June 24-26.

American Public Power Association—Hotel Biltmore, New York City, June 25-27.

National Machine Accountants Association—6th Annual Conference, Conrad Hilton Hotel, Chicago, Ill., June 26-28.

JULY-AUGUST

• **Southeastern Electric Exchange**—Personnel Administration Section Conference, John Marshall Hotel, Richmond, Va., July 25-26.

Western Electronic Show and Convention—Annual Meeting, Cow Palace, San Francisco, Calif., August 20-23.

American Institute of Electrical Engineers—Pacific General Meeting, Yakima, Washington, Aug. 26-30.

SEPTEMBER

American Institute of Electrical Engineers—2nd Special Technical Conference and Exhibit on Magnetic Amplifiers, Hotel Penn Sheraton, Pittsburgh, Pennsylvania, September 4-6; Sixth Annual Industrial Electronics Symposium co-sponsored with Institute of Radio Engineers, Morrison Hotel, Chicago, Ill., Sept. 24-25.

Instrument Society of America—12th Annual Instrument Automation Conference and Exhibit, Cleveland Auditorium, Cleveland, Ohio, Sept. 9-13.

Illuminating Engineering Society—National Technical Conference, Biltmore Hotel, Atlanta, Ga., Sept. 9-13.

Maryland Utilities Association—33rd Annual Fall Conference, Cavalier Hotel, Virginia Beach, Va., Sept. 13-14.

Edison Electric Institute—Accounting Division Organization Meeting, jointly with AGA, Lemington Hotel, Minneapolis, Minn., Sept. 19-20; Industrial Relations 10th Annual Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 23-25; Meter & Service Committee, Hotel Nicolet, Minneapolis, Sept. 23-25; Electrical Systems and Equipment Committee, Cosmopolitan Hotel, Denver, Colo., Sept. 30-Oct. 1.

Public Utilities Association of the Virginias—39th Annual Meeting, White Sulphur Springs, West Virginia, September 20-21.

American Society of Mechanical Engineers—Fall Meeting, Statler Hotel, Hartford, Conn., Sept. 23-25.

• **Electric Companies Advertising Program**—Copy Group Meeting, Detroit, Mich., Sept. 25.

Electric Companies Public Information Program — Workshop Conference, Whittier Hotel, Detroit, Mich., Sept. 25-27.

OCTOBER

• **Pennsylvania Electric Association**—50th Annual Meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., Oct. 2-3.

Indiana Electric Association — French Lick-Sheraton Hotel, French Lick, Ind., Oct. 2-4.

International Association of Electrical Leagues—Annual Conference Sheraton-Gibson Hotel, Cincinnati, Ohio, October 2-5.

National Electronics Conference, Inc—Hotel Sherman Chicago, Ill., Oct. 7-9.

American Institute of Electrical Engineers—Fall General Meeting, Morrison Hotel, Chicago, Illinois, October 7-11.

• **Edison Electric Institute** — Area Development Workshop, Phoenix Hotel, Lexington, Ky., Oct. 10-11; Transmission & Distribution Committee, Statler Hotel, Boston, Massachusetts, October 17-18; Accounting Division Taxation Accounting Committee, held jointly with AGA, Williamsburg, Va., Oct. 23-24.

Interstate Power Club—Hotel Martinique, New York City, N. Y., October 14.

Atomic Industrial Forum—Annual Conference, New York City, Oct. 28-30.

American Nuclear Society—Winter Meeting, New York City, Oct. 28-30.

National Association of Railroad Utilities Commissioners—Annual Convention, Peabody Hotel, Memphis, Tennessee, October 28-31.

• Additions this week.

Twelve Electric Utilities Buy New General Electric Automatic Dispatching System

Completely automatic control provides answer to problems caused by rapid extension of interconnections and the trend to pool operation.

Successful operation of the new General Electric automatic dispatching system has resulted in rapid acceptance by many utilities of this unique system to help solve the problem of generating power at the lowest possible cost.

Introduced recently, the G-E system has already been ordered by 12 power companies.

If you are concerned with the problems of meeting the rapidly increasing demand for electric energy, of maintaining interchange power schedules and frequency, and of operating most economically, why not investigate the first completely automatic dispatching system.

Here are some of the major reasons why 12 utilities have already ordered General Electric automatic dispatching systems:

1. Most economical schedule is automatically computed and executed based on loading at incremental cost of delivered power.

TYPICAL INSTALLATION of General Electric automatic dispatching system equipment includes this dispatcher's office console.

2. Only one control channel is needed for each generating station and no recorders are required as an integral part of the General Electric system.

3. Low installation expense because the control equipment is factory assembled and tested in "package" consoles requiring few customer connections.

4. Continuous control makes cost information always available to provide economic operation and correct "buy" or "sell" decisions.

5. Dispatcher need not calculate detailed daily loading schedules nor does the addition or removal of machines require any readjustment of control equipment.

6. Transmission-loss penalty factors are determined and applied manually or automatically.

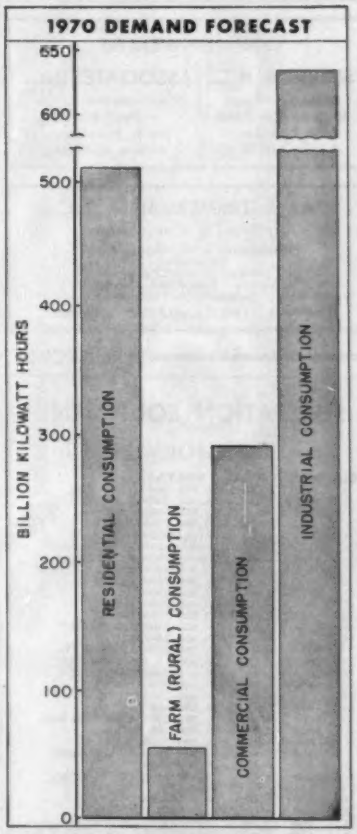
7. Continuous and synchronized control is provided by the use of a highly accurate selsyn system installed on generator governors.

8. An individual installation can be conveniently expanded to bring more generation under control or to increase the functions of the existing control.

9. The control system is readily adaptable to pool operation in the interconnection of utilities.

10. The General Electric ADS equipment is compatible with other control equipment already installed.

Complete information may be obtained by contacting your nearest General Electric Apparatus Sales Office, or by writing to Section 585-59, General Electric Company, Schenectady 5, New York.



Information for above chart from Electrical World Market Research Department and the McGraw-Hill Department of Economics.

RAPID GROWTH of power demand will multiply your dispatching problems. G.E.'s automatic dispatching system is uniquely designed to improve your present operation and help you prepare for the future.

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Qu.	KVA	MFGR.	VOLTAGE
3	667	Kuhl.	66,000-480
3	200	Pitts.	66,000-2300
3	1500	Wag.	44,000-6900/11950
3	75	West.	44,000-7200/12470Y
3	5000	G.E.	26100/66000-6600
4	3125	Mol.	39900/66000Y-26600/46000Y
3	3333	G.E.	33000/11000-2400/7200
2	3000	Stand.	33,000-4160, 3 Ph.
4	1667	West.	34,500-7200, Inertaire
2	1500	A.C.	34,500-2300
3	667	A.C.	33,000-2400/4160Y
4	333	Kuhl.	33,000-7200/12470Y
3	200	A.C.	34,500-2400/7200/12470Y
3	75	Wag.	33,000-240/480
1	3000	A.C.	25,380-2500/4330Y, 3 Ph.
3	2000	A.C.	26,400/13,200-2300/4140
3	1000	G.E.	23,310-2500/7500/12990Y
3	100	G.E.	22,000-7200/12470Y
3	50	G.E.	22,000-2300
3	1667	G.E.	13,800-600
1	1000	West.	13,200-2300, 3 Ph. Unit Sub.
1	1000	A.C.	13,800-480, 3 Ph.
1	600	Stand.	13,200-2300, 3 Ph.
1	450	Penna.	13,200-2400, 3 Ph. Askarel
3	200	G.E.	13,200-2400
1	2500	A.C.	11,000-2400/4160Y, 3 Ph.
3	125	A.C.	6900-2300
3	100	G.E.	4800-120/240
3	50	Mol.	4160/7200-240/480
3	500	West.	2400/4160Y-240/480
3	150	West.	2400-230/15
1	100	G.E.	2300-575, 3 Ph.
6	50	West.	2400-114/228, Dry Type
3	25	G.E.	480-120/240

FEEDER REGULATORS—Outdoor

1	250	A.C.	601 A. 2400 V. 3 Ph. STEP
3	96	G.E.	200/400 A. 2400 V.1 Ph.IND.
6	36	West.	150/300 A. 2400 V.1 Ph.IND.

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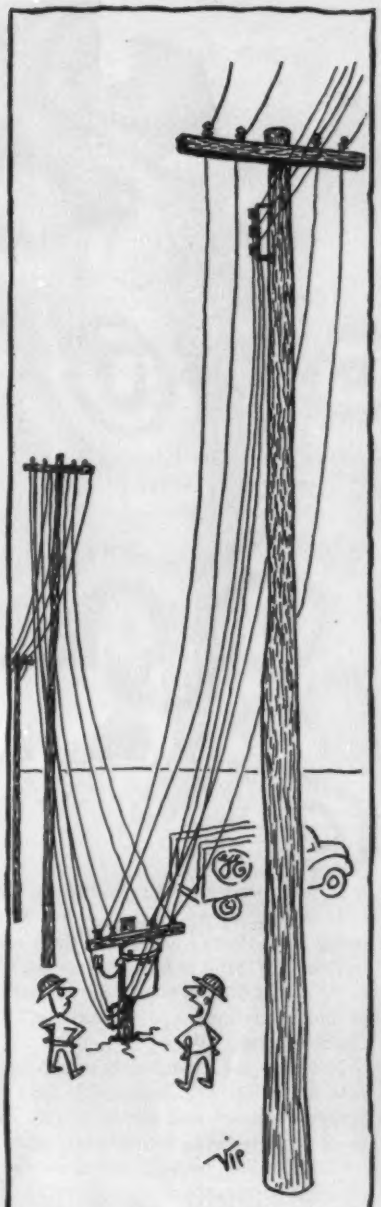

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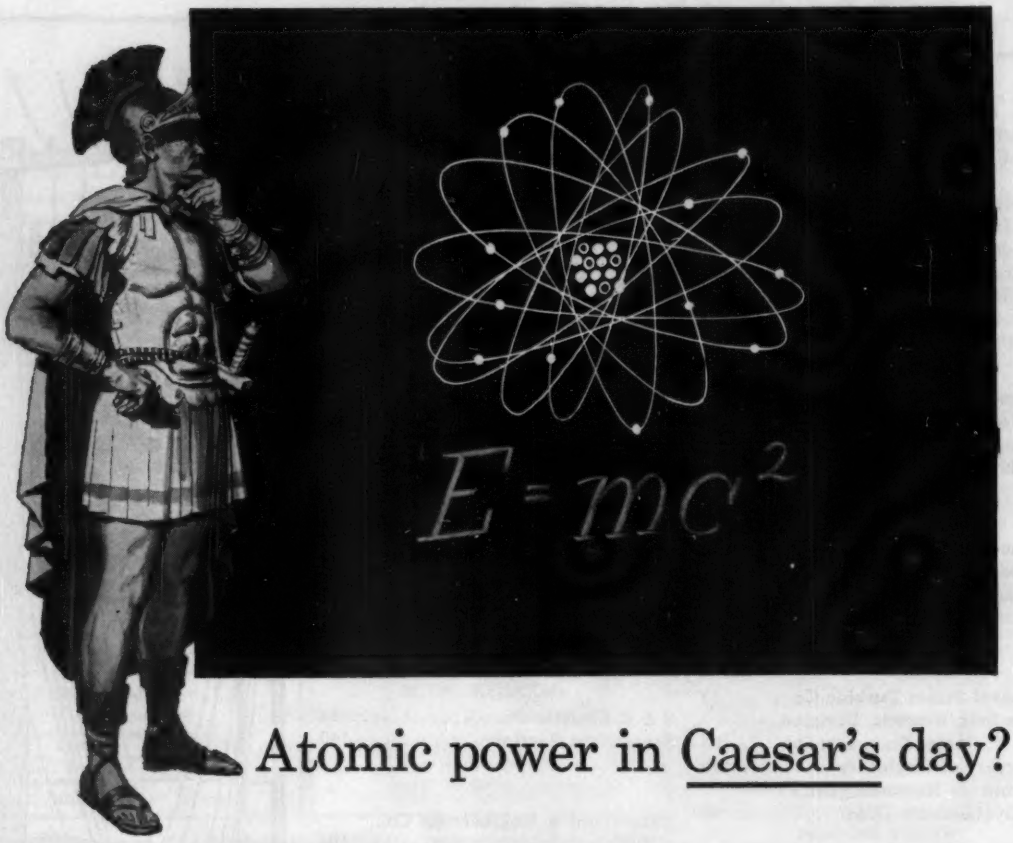

Atomic power in Caesar's day?

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The only thing new is knowledge . . . knowledge of how to get at and rearrange raw materials. Every invention of modern times was "available" to Rameses, Caesar, Charlemagne.

In this sense, then, we have available *today* in existing raw materials the inventions that can make our lives longer, happier, and inconceivably easier. We need only *knowledge* to bring them into reality.

Could there possibly be a better argument for the strengthening of our *sources* of knowledge—our colleges and universities? Can we possibly deny that the welfare, progress—indeed the very *fate*—of our nation depends on the quality of knowledge generated and transmitted by these institutions of higher learning?

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